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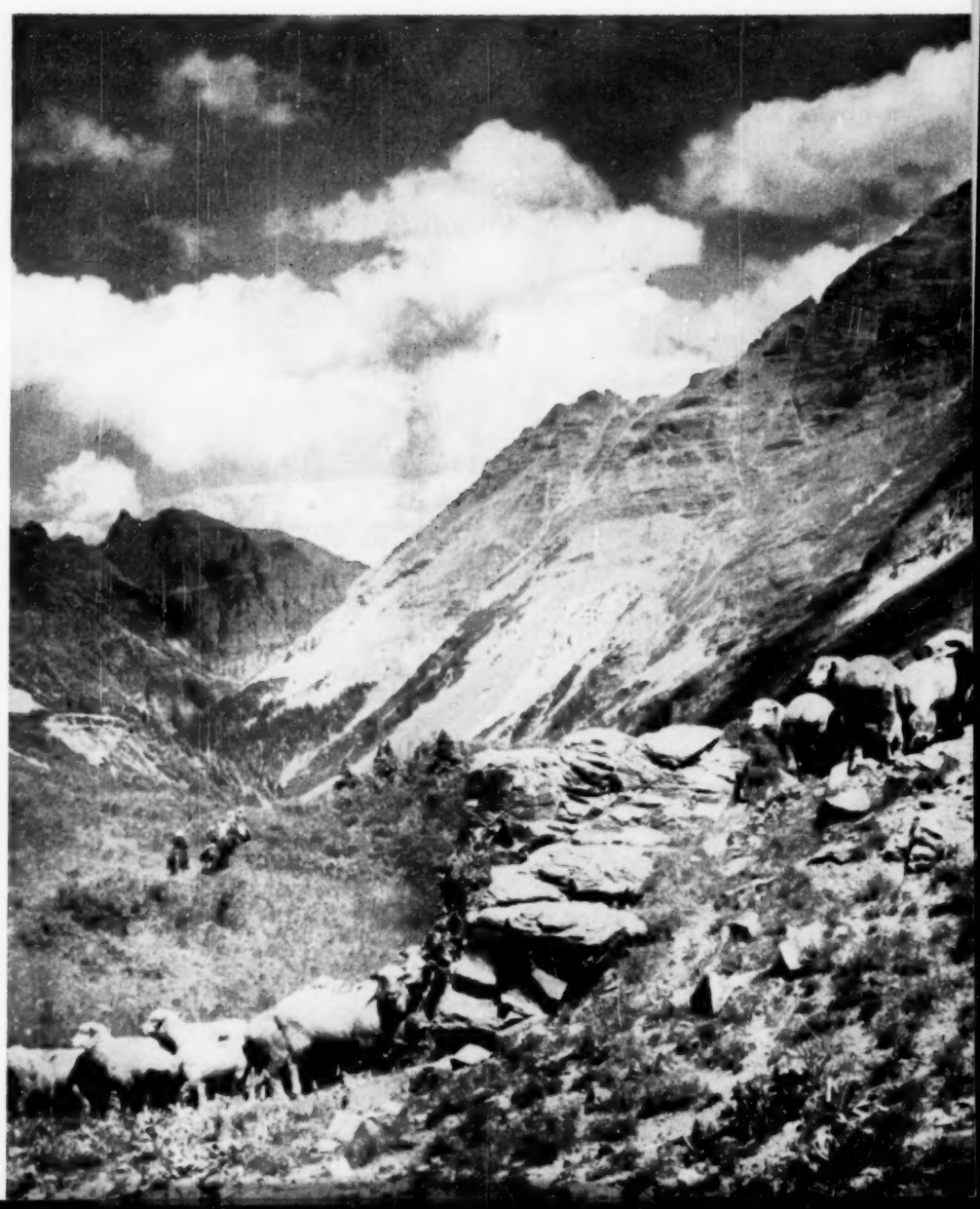
MARCH 1950



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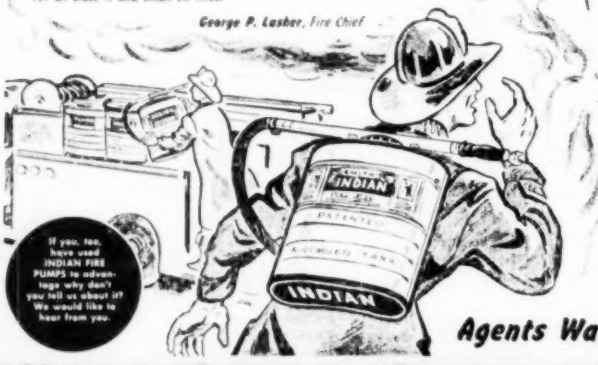

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Photo by *R. D. Hostetter*

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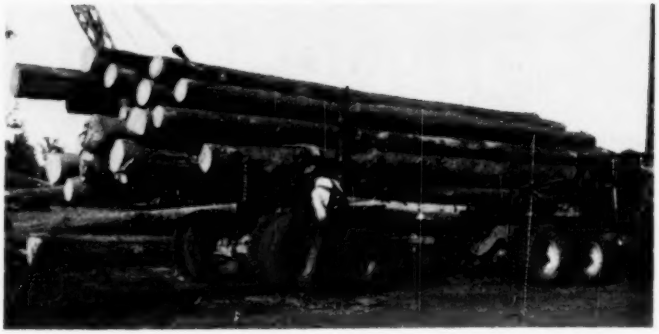

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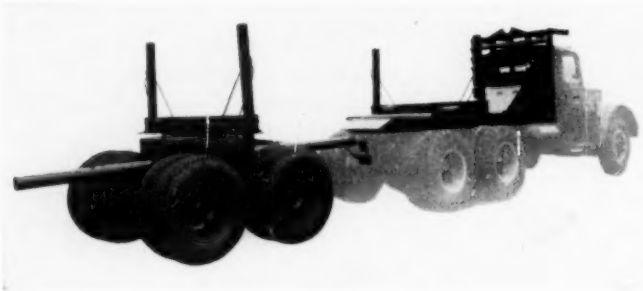

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Forestry Background of Pacific Northwest[1]

W. B. Greeley
Vice president, West Coast Lumbermen's Association, Seattle, Wash.

IN SOME respects the story of the Pacific Northwest differs sharply from that of the older forest regions. We were late in getting started. The conservation movement at the turn of the century caught us in the full stride of development. Forty percent of our timber was withdrawn in national forests. Even in the days of exuberant exploitation, we felt strongly the influence of national policies.

Our story has much of the interplay of public pressures, as well as economic pressures, upon the gainful pursuits of a typical bunch of rugged Americans. It illustrates the democratic process of working out problems between industry and the public. In the Pacific Northwest, we have simmered and at times boiled over in a melting pot of experience, controversy, and cooperation.

Prior to about 1933, the controlling factor in Northwest forest industries was the availability of cheap timber. Conservation propaganda and fears of timber famine had little effect upon industrial practice because more virgin stumpage could usually be bought cheaply in the next valley or the next county. Furthermore, forest products were frequently in oversupply. Sawmills often could not operate at capacity. There were fierce struggles for survival. The speculative ownership of many small tracts of timber caused much instability. Low and uncertain profits kept most of the operators in a "cut-out and get-out" frame of mind.

Geography forced the West Coast sawmills into the mold of an extremely wasteful industry. They were remote from large centers of lumber consumption. They had no substantial nearby market to consume low grades and left-overs. They made a precarious living by musceling into the midwestern and eastern trade with high-grade items that would stand the cost of a transcontinental haul.

At a national lumber meeting some twenty years ago, the dean among western timbermen said that more wood is left on an acre of logged-off Douglas-fir than any acre of eastern forest ever grew. It was not until World War II that our industry could start shaking off this economic straitjacket of sheer inability to utilize a large part of its raw material.

Cooperation in Protection

The No. 1 job of controlling forest fires was shouldered in practical fashion. The usual method was the fire association, in which a regional group of forest owners pooled their holdings for protection, at a pro rata acreage charge. The western fire organizations, formed between 1905 and 1920, wrote a great deal of forest history. Their principle, that each owner should pay for protecting his own property, was written into several state compulsory patrol laws. In fact, the western state fire codes were developed largely from the experience of the private associations. And they took a very practical cast —such as compulsory fire equipment at logging camps, compulsory slash disposal, closed fire seasons and compulsory shutdowns in dangerous fire weather.

The Clarke-McNary Act of 1924, which established the federal policy of cooperation with states and private owners in forest protection, had its origin in the experience and success of the western associations. Here was a clear instance where industrial initiative and experience took the lead in federal policy.

Influence of Forest Service

Federal conservation policies in their turn were quietly shaping the trends of northwestern forest industry, even in the days of cheap timber. The creation of national forests and their administration on the principle of sustained production was the first step in the stabilization of the industry. The sales of federal timber, the unending discussions of cutting and reseeding methods, the very disputes and quarrels, were a continuing classroom to the lumbermen. They learned forestry—in their own woods; and the technical foresters learned as much as the timbermen.

The day-by-day cooperation in fire protection, with its mutual problems and responsibilities, the research of the Forest Service in timber growing and utilization, the advice given to many individual companies—all added to the practical education of the industry. So did the constant infiltration of young foresters into logging camps, sawmills, fire organizations, and the ranks of management itself. There are 600 trained foresters in industrial employment in the five western states. While the cold facts of supply and demand called the tune on business thinking and investment, the rapid response of the industry to new economic opportunities was due largely to its educational preparation.

Faith in the Land

There was noteworthy leadership within the industry itself. In the days when it was general practice to quit paying taxes on a section of land as soon as its timber was logged, a few far-sighted men held

[1] Presented at the annual meeting of the Society of American Foresters, Seattle, Wash. on October 11, 1949.

their cut-overs. Often they were moved by a sense of responsibility to the communities they had created. But some of them also had faith in the land, a faith—however blind—that someday the menace of confiscatory taxes would be eased and the land would again grow paying crops of trees. It was not long before Mother Nature confirmed this faith by reclothing much of the logged-off land with dense stands of young fir and hemlock.

About 1930, the legislatures of Oregon and Washington authorized the optional separation of land from harvest taxes on logged-off areas classified for reforestation. These laws made available to the timber grower a fixed land tax of 4 or 5 cents per acre, with a harvest tax of 12½ percent on the current value of any stumpage that may subsequently be cut. Those state laws largely stabilized long-range taxes and thereby laid the cornerstone for the West Coast tree farms of today.

The NRA Lumber Code

I take 1933 as a turning point because that date marks the first industry-wide effort consciously to log its forests so that the land will restock with trees. This was required in the industry code of self-government, adopted under the National Industrial Recovery Act. The many obsequies pronounced over the unlamented NRA do not record much to its credit. Let it be said therefore that NRA went a long way to usher in general industrial reforestation in the Pacific Northwest.

The timber associations took their obligation seriously. Forest cutting rules were adopted. Foresters were employed to explain and enforce them in the woods. Meetings were held with loggers up every branch creek. It was practical education; and it took hold. When the Supreme Court threw out NRA and all its works, probably 65 percent of the current West Coast logging was doing a fair job of reforestation.

Then the industry took the initiative. The groups which had sponsored the NRA lumber code voted to carry on its conservation provisions as a voluntary program, without benefit of legal sanctions. Association foresters went right on, inspecting logging operations, explaining the rules of cutting practice, and doing their best to secure compliance. Most of the operators conformed with the forest code in spirit if not with the letter.

Public opinion was a potent influence upon the actions and reactions of these business men. An increasing number of them became interested in keeping up the productiveness of their lands. Many regarded it as good public relations. Since the early 1930's the Forest Service had stressed the need for federal regulation of private timber cutting; and the conviction was spreading among northwestern lumbermen that the way to prevent an invasion by Uncle Sam's marshals was to make a good showing of reforestation themselves. Then too the years of conservation propaganda and local contacts with foresters were bearing fruit. We were all getting used to the idea. And many hard-headed business men could see a profit in growing trees.

State Laws

The sword-play between a potent federal agency bent upon the regulation of private timber cutting and a group of industrialists determined to prevent it has flashed in and out of the northwestern forest drama for fifteen years.

In 1941, the industry's code of forest practices became the forest conservation law of Oregon. In Washington, the industry was several years ahead of the state legislature. The code was finally written into the Washington Forest Practices Act of 1945. Most forest owners supported these actions of the two states to curb destructive logging. The forestry program of the industry organizations was centered upon making the state controls of logging practice work effectively. Their forestry staff was busied in explaining the state requirements and showing the loggers how best to comply with them. When the Washington law was challenged in court, the industry's counsel intervened in support of the statute.

The future of the Washington Forest Practices Act will be of interest to our entire profession. It was sustained by the Supreme Court of Washington as a proper exercise of police power. That decision has now been appealed to the Supreme Court of the United States. So we may expect, within six or eight months, a ruling by the highest court of the land upon the power of a state to control timber cutting practices. That will be one of the master decisions in the judicial structure of American forestry.[2]

The Oregon Forest Conservation Act has been amended and strengthened by four successive legislatures. The Washington Act has been stiffened by one set of amendments. These laws represent the most drastic use of state police power to maintain the productiveness of forest land yet attempted in this country. Every commercial logger must obtain a state permit to operate, every year. It commits him to observance of the conservation act and may be cancelled or withheld for nonobservance. The basic requirement is to reforest the land cut-over to a minimum of 300 seedlings per acre. This requirement will be met legally by reserving from cutting at least 5 percent of the standing timber in the case of Douglas-fir stands or all trees under certain diameters in stands of pine. Any forest owner may offer his own alternative plan of reforestation; and follow it if approved by the state forester.

Legal responsibility for observance rests upon the owner of the land. On areas found in default, the owner is subject to a penalty of $8 per acre. He may, in lieu of a cash penalty, give bond to restore the required stocking of trees by planting.

Many foresters are doubtful of attempts to force the growing of trees by legal mandate. I view it primarily as a stop-loss, a partial protection of the resource until real forest management takes over. That

[2] On November 7, 1949 the Supreme Court of the United States sustained the Washington Supreme Court's decision that the Act was constitutional—Editor.

means management inspired by the enlightened self-interest of the land owner.

The greatest value of forest practice codes in the Pacific Northwest has been educational. They have brought forestry in forceful and specific terms to the attention of thousands of owners and operators, little and big, right in their own woods. Let me add that I can not conceive of this kind of sumptuary legislation working successfully unless it is of local origin and grows up from the grass roots of local understanding and experience. The conservation acts of Oregon and Washington started with the voluntary adoption of the NRA Lumber Code, by the industry to which it applied.

West Coast Tree Farms

As we emerged from the depression in the late thirties, the reviving economic status of lumber and wood pulp put more steam into industrial forestry on the West Coast. Many forest operators were also realizing that virgin timber could no longer be obtained in the next county. Stumpage was rising in value, and more strongly held. The increasing volume of second-growth logs coming into use pointed up practical results from holding cut-over lands. More and more operators woke up to the value of the asset they had long overlooked—the growing power of the soil. Not a few loggers of the old "cut-out-and-quit" persuasion bought back from their counties the very cut-over lands which they had dropped through tax delinquency.

This interest in the land led, in 1941, to a new term in American land usage—Tree Farms. A tree farm is any piece of land, from a farm woodlot of 40 acres to a lumber or pulp company's holding of 400,000, which is set up by its owner for continuous timber cropping. It may be an operating property on which logging is in progress or a logged area held for future growth. Tree farms in the Douglas-fir region have now reached three million acres; and a further large area is shaping up for similar forest management. We try zealously to keep our tree farms from degenerating into window dressing. There are periodic inspections and several certificates have been cancelled for failure to take their requirements seriously.

The tree farmers form a sort of grand lodge of forestry-minded men who try out new things, interchange information, and organize joint undertakings in timber growing. An example is the industry's forest nursery at Nisqually, Washington. A number of tree farmers became convinced that it would pay to plant with young trees the burnt-out spots and other blanks in their natural reseeding. They made it possible for the association to launch a forest nursery which now distributes 9 to 10 million seedlings yearly, at cost of production, to tree farms in the region. Our experience indicates that under the prevailing method of block clear-cutting and an average fire history, 85 to 90 percent of a large property will be restocked from natural seeding. With tighter fire control, the planting job is shrinking. Some tree farms are now experimenting with quicker and cheaper restocking of recent burns by seeding from helicopters. That might indeed become standard practice, immediately after a large fire.

The New Timber Cruising

The most fruitful, overall result of the awakened interest in the land under the timber is a new form of timber cruising. Many foresters have been employed to take inventory of cut-over and second-growth lands, as to present stocking with young trees, rate of growth, age, fire hazard, areas in need of planting, and so on. The industry began to appraise its long neglected asset in the soil; and to develop the records and techniques for long-range forest management. It is interesting to note in how many cases this process of fact gathering, of expert study of land for growing trees as one might study its possibilities of yielding coal or petroleum, has sold the owner on forestry.

The most important single lesson we have learned—in these days of change in the Pacific Northwest—is to know your own land and its growing power. Don't assume what your cut-over land bears today or what it can grow in the future. Study it as a good farmer studies his fields. That is where forest management begins.

One result of these cut-over inventories is very evident. Cut-over land is no longer a drug on the market or a large item on delinquent tax rolls. Everywhere it is in active demand. Whenever a lumber company follows the old philosophy of "cut-out and quit" to the bitter end, its sawmill goes to the junk yard but there are usually three or four bidders for its land.

War and Postwar Markets

War and post-war markets brought higher values to every kind of stumpage in the United States. They have given American forestry an economic strength and confidence which it never had before. In the Pacific Northwest, the change in cutting practices which began generally in 1933 has become an industry-wide movement toward intensive forest management.

One of the most significant features of this change is the new wave of industrialization that is flowing into northwestern forests and bringing economic uses of material previously left for the slash fires. The manufacture of wood pulp is expanding. New fiber-board industries have become established. Ethyl alcohol is recovered from spent pulping liquor. The commercial production of wood sugar, by hydrolosis of sawdust or shavings, is under test—with ethyl alcohol, fodder yeasts, and molasses as ultimate products. Douglas-fir bark is processed at one plant into plastic powders and fertilizers.

The thinning of young second-growth for pulp and fiber stock has begun. We are getting outstanding examples of the correlated use of all the raw materials in the forest, from peeler logs to pulpwood. These developments put greater assurance into the growing of trees. Wood utilization is the key to forest management.

The Salvage Era

I can hardly overstate what the change in our utilization picture, even though still partial and spotted, means to West Coast forestry. The last five years have brought salvage logging, that is, working over old slashings and recovering often 20 cords per acre of small and defective logs and pulpwood.

Pre-logging in some operations removes small material before it is smashed up by the heavy timber. Snags and old windfalls are being utilized to a degree never before possible. All of this is improving fire control both by removing fuel and by extending branch roads into cut-over and second-growth areas. Through road building, it is helping the industry get started on the thinning of dense stands of second-growth, which promises to be our next great advance in management. In other words, the West Coast is now beginning to get the economic outlets for marginal material that are the basis of intensive forestry the world over.

Another trend resulting from tree farm inventories and salvage logging is a reappraisal of future wood costs in terms of accessibility and site. Our stumpage values rose sharply after World War II. The virgin timber front is receding into the hinterland; and most of our hinterland is pretty rugged country. Log transportation from mountain to tidewater has become a major factor in cost. Operators planning for long-range wood supplies are looking to the possibilities of intensive management and utilization on the more accessible areas of good growth rates.

Practical Cooperation

I have referred to the fifteen years of sparring between private enterprise and federal regulation. Let me conclude by drawing the other side of this picture. The relations between government and industry in the Pacific Northwest—down to the present day—carry a lot of practical cooperation. They illustrate a very fine American trait. *We fight over economic or political ideologies, but work together on the practical job of doing first things first.*

Western government and industry men learned to cooperate in a hard school—the prevention and fighting of forest fires. Day-by-day relations in the protection of adjoining properties, in carrying out the policies of the Clarke-McNary Act, in selling and logging federal timber, in a thousand projects of research and mutual community interest have kept our cooperation very much alive.

In 1944, the industry joined the Forest Service in asking Congress to enact Public Law 273. It authorizes the administrator of any federal forest, available for commercial use, to contract with adjacent private owners for the joint management of a logical area as a sustained yield unit. This little-known statute points up the possibilities of cooperation between government and industry.

The first contract under this law was approved in 1946 between the Forest Service and a logging company on Puget Sound. It puts an industrial tree farm of 160,000 acres and 110,00 acres of national forest under unified management for a period of one hundred years. All the timber cut from the combined area is to be manufactured at two designated communities, whose wood-using pay rolls of 1,500 workers are thus underwritten for the next one hundred years.

It is interesting to note that the company which joined the government in this long-range enterprise has worked out a correlated use of its logs which employs 20 year-round workers for every million feet of timber felled in the woods. The average West Coast sawmill and logging camp employ 7 or 8 year-round workers for every million feet of logs. This is something to think about, from the standpoint of the stake of the public in effective forest management.

Public Law 273 has been widely attacked because of its monopolistic features. It does, unquestionably, set up a monopoly of the public timber included in one of these deals. The practical question becomes: Do the public benefits in forest management, closer utilization of wood, assurance of jobs and community security justify the degree of monopoly involved? It is impossible to predict how far the federal agencies will carry the policy set up in this statute. Its administration involves great difficulty and responsibility. The educational value of the hearings and discussions is enormous. They have led not only many forest operators but many communities to look again at their hole card of resources for the future.

Here is another example of cooperation. The management of second-growth stands is crowding hard upon the West Coast industry. It created overnight a demand for facts about second-growth far ahead of what was available. The Pacific Northwest Forest and Range Experiment Station of the Forest Service summoned forest educators, industrial foresters, and executives to a council of war. A joint project speedily took shape—to bring together in a quick government bulletin, everything that anyone in this region could contribute on second-growth forestry. That bulletin was in distribution within a year after the first call. A second edition, with further material and revision, will appear a year hence. Meantime the Forest Service has undertaken a comprehensive study of current results in second-growth cutting and is establishing permanent experimental areas for tests of thinnings, growth rates, and so on. Our Forestry Procedures Committee and Forest Soils Committee, of the Douglas-fir region, illustrate the same sort of effective cooperation.

When men work together like this—on practical situations—we need not worry over much about conflicting ideologies in either religion, politics, or forestry.

Statistics from Schools of Forestry for 1949: Degrees Granted and Enrollments

Cedric H. Guise

Professor of forestry, College of Agriculture, Cornell University, Ithaca, N. Y. During 1929-1931 he was assistant director of the Forest Education Inquiry and co-author of *Forest Education*. Since 1933 he has assembled and published annually statistics from all forestry schools in the United States.

This article is another in a series of comparable papers appearing annually in the Journal of Forestry since 1934, reporting the enrollment at the schools of forestry and the numbers of degrees conferred. Statistics of this type were first assembled when the Forest Education Inquiry made its study in 1929-1931, and were published in the Inquiry's report in 1932.[1] *The annual articles in the Journal have brought to date the figures for each successive year.*[2]

THE 32 schools of forestry that submitted statistics for 1949 are the same that were included in the report for 1948. Of these 32 schools, 22 are accredited by the Society of American Foresters, 5 are listed, and 7 are in the non-listed category.

The 1949 statistics show that 1,443 undergraduate degrees were conferred, that the total undergraduate enrollment is 7,469, that there are currently 2,501 seniors enrolled, and that the number of seniors exceeds the enrollments in any of the other three undergraduate classes. A summary of significant figures for 1949 appears in Table 1, along with comparable statistics for the years 1947 and 1948. The detailed statistics and the significant trends are presented and analyzed in the discussion that follows.

Degrees Granted

During the calendar year 1949, the 32 schools of forestry reported the awarding of 1,443 undergraduate degrees, 205 master's degrees, and 12 doctorates.

The number of bachelor degrees is 525 in excess of the 918 reported for 1948; it is by far the greatest number ever reported for a single year, being 341 more than the previous peak of 1,102 reported for 1939. On the basis of senior class enrollments totalling 2,501, it is apparent that the number of undergraduate degrees to be awarded in 1950 for the completion of studies in forestry will be 800 or 900 more than the 1,443 reported this year. In 1951 the number will not be so high, and will probably be in the neighborhood of 1,500. Of course, the reason for these large numbers in 1949 and 1950 lies in the heavy registration by veterans at the schools during the past three years.

The number of master's degrees reported for 1949 is 205, a decrease of 17 from the 222 awarded in 1948. Of the 205 master's degrees, 140 or 68 percent were reported from 5 schools, namely California 11, Duke 36, New York State College of Forestry 20, the University of Michigan 27, and Yale 46. With 450 men now registered as candidates for master's degrees, it appears as if a somewhat larger number than that of this year will be awarded in 1950. Only 12 doctorates were reported from 6 schools, one each from the University of Michigan, Minnesota, and Yale, 2 each from California and Duke, and 5 from the New York State College of Forestry.

Statistics dealing with the numbers of degrees conferred are summarized in Table 1, presented in detail for the individual schools in Table 2, and shown in total for all schools for each of the years 1900 to 1949 in Table 3.

The total number of undergraduate degrees granted since 1900 from all schools in the United States is now 15,380 (Table 3). Master's degrees conferred since 1902 total 2,845. With the 12 doctorates reported in 1949, the total of these degrees awarded for studies completed in forestry and its underlying sciences now becomes 184.

In February 1949, 30 men completed their training at the New York State Ranger School; in all 909 men have been awarded certificates for the completion of the ranger school course.

Enrollments

Tables 4 to 10 deal with enrollments at the schools of forestry.

Table 4 shows the enrollments by classes at each school for the fall term of 1949-1950.

Table 5 lists the totals of undergraduate enrollments at all schools for each of the years 1903-1904 to 1949-1950.

Table 6 present the undergraduate enrollments by classes at all schools for each of the years 1933-1934 to 1949-1950. It also shows the increases or decreases by years for each of the four undergraduate classes.

Table 7 lists for all schools for each of the years 1931-1932 to 1949-1950 the total numbers of men registered as candidates for the master's and doctor's degrees.

TABLE 1.—SIGNIFICANT STATISTICS FOR 1947, 1948, AND 1949

	1947	1948	1949
Bachelor's degrees conferred	554	918	1,443
Master's degrees conferred	223	222	205
Doctor's degrees conferred	7	16	12
Undergraduates enrolled	7,454	8,212	7,469
Members of freshman class	2,061	1,851	1,485
Members of the sophomore class	2,878	2,178	1,667
Members of the junior class	1,577	2,497	1,816
Members of the senior class	938	1,686	2,501
Graduate students—master's	339	330	450
Graduate students—doctor's	80	93	98

[1]Graves, H. S. and C. H. Guise, Forest Education. Yale Univ. Press, New Haven, 1932.

[2]Guise, C. H. (Sixteen articles on degrees granted and enrollments at schools of forestry in the United States, 1934-1948.) Jour. of Forestry 32:337-343; 33:402-405; 34:114-120; 35:77-83; 36:12-18; 37:197-202; 38:241-246; 39:359-364; 40:196-202; 41:87-91; 42:357-360; 43:172-175; 44:110-114; 45:174-180; 46:168-173; 47:93-100.

TABLE 2.—NUMBER OF DEGREES GRANTED FOR COMPLETION OF STUDIES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE CALENDAR YEAR 1949

Accredited schools	Undergraduate degrees	Master's degrees	Doctor's degrees
1. California	67	11	2
2. Colorado	58	7	
3. Duke		36	2
4. Florida	66	2	
5. Georgia	85	2	
6. Idaho	36	3	
7. Iowa	69	1	
8. Louisiana	49	5	
9. Maine	55		
10. Michigan University	86	27	1
11. Michigan State	89	6	
12. Minnesota	68	7	1
13. Montana	55	3	
14. New York	155	20	5
15. North Carolina	52		
16. Oregon	85	1	
17. Pennsylvania	69	5	
18. Purdue	52		
19. Utah	58	9	
20. Washington University	60	7	
21. West Virginia	26		
22. Yale		46	1
Total	1,331	198	12
Listed schools			
1. Alabama	26		
2. Harvard		7	
3. Massachusetts	10		
4. Michigan Mining			
5. Missouri	15		
Total	51	7	
Nonlisted schools			
1. Connecticut	7		
2. Louisiana Polytechnic	14		
3. New Hampshire	15		
4. Oklahoma			
5. Tennessee	3		
6. Texas	8		
7. Washington State	14		
Total	61		
GRAND TOTALS	1,443	205	12

TABLE 3.—NUMBER OF DEGREES GRANTED FOR COMPLETION OF STUDIES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE CALENDAR YEARS 1900-1949

Years	Undergraduate degrees	Master's degrees
1900	1	
1901	5	
1902	2	9
1903	3	14
1904	9	29
1905	9	34
1906	24	24
1907	19	27
1908	31	35
1909	47	44
1910	61	48
1911	100	61
1912	122	54
1913	136	37
1914	151	42
1915	124	35
1916	151	36
1917	160	27
1918	65	10
1919	53	6
1920	160	25
1921	126	26
1922	141	44
1923	217	31
1924	215	43
1925	280	44
1926	259	58
1927	263	50
1928	302	64
1929	291	54
1930	308	69
1931	394	97
1932	380	78
1933	355	65
1934	337	47
1935	423	58
1936	502	67
1937	803	75
1938	980	95
1939	1,102	112
1940	1,072	105
1941	834	117
1942	654	76
1943	446	28
1944	106	12
1945	51	18
1946	192	65
1947	553	223
1948	918	222
1949	1,443	205
Total	15,380	2,845

Table 8 gives the enrollments at each school for the fall term 1949-1950, classifying undergraduates and graduates into veteran and nonveteran groups. It also shows the total enrollments classified by men and women.

Tables 9 and 10 present further information dealing with veteran and nonveteran enrollments.

In the tables dealing with enrollments, special students are excluded. The data dealing with special students are not complete; from the information contained on the questionnaire forms, apparently very few schools admit students in this category.

The total undergraduate enrollment reached its peak last year, when a registration of 8,212 was reported. The decline to 7,469 for the current year represents a drop of 743 from the total of last year and is only 15 higher than the 7,454 of 1947-1948. However, the undergraduate enrollment of this year is the second highest ever reported.

In 1950 a further decrease is certain; the total will probably be between 6,000 and 6,500; in the writer's opinion this total will approximate the lower rather than the higher figure, this estimate being based on the enrollment trends in the two lower classes.

The New York State Ranger School reports 60 men registered for the year 1949-1950.

Enrollments by Classes

As previously mentioned the enrollments reported for the seniors from all schools totals 2,501. This number is the highest ever reported, exceeding the previous high peak of 1,686 for 1948-1949 by 815. It is the fifth successive year in which the registration of seniors has been increasing. In the fall of 1950, however, a sharp decrease will occur, with an estimated number of 1,800 students to be reported.

It will be seen that 7 men are listed as seniors at Yale. These men are seniors in Yale College, enrolled in plant science with a forestry major, and taking the first two years of work leading to the master's degree. The inclusion of these 7 may be questioned, but since they were reported it was thought best to incorporate them in the 1949 statistics.

TABLE 4.—ENROLLMENTS BY CLASSES AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE FALL TERM 1949-1950

Accredited schools	Freshmen	Sophomores	Juniors	Seniors	Total undergraduates	Graduates	
						Master's	Doctor's
1. California	31	44	80	86	241	24	6
2. Colorado	—	34	64	100	198	7	—
3. Duke	—	—	—	—	—	48	6
4. Florida	80	70	64	62	276	12	—
5. Georgia	34	49	57	113	253	10	—
6. Idaho	68	47	48	78	241	11	—
7. Iowa	62	87	88	80	317	4	—
8. Louisiana	—	28	48	90	166	12	—
9. Maine	72	45	55	77	249	4	—
10. Michigan University	26	47	82	125	280	50	20
11. Michigan State	88	83	131	247	549	33	9
12. Minnesota	65	98	85	109	357	16	10
13. Montana	55	64	83	117	319	3	—
14. New York	180	188	183	198	749	59	25
15. North Carolina	39	58	52	89	238	6	—
16. Oregon	68	116	74	120	378	9	—
17. Pennsylvania	108	86	79	107	380	13	—
18. Purdue	43	60	65	82	250	7	—
19. Utah	83	74	93	100	350	28	—
20. Washington University	74	65	74	112	325	25	2
21. West Virginia	51	52	54	77	234	—	—
22. Yale	—	—	—	7	7	60	20
Total	1,227	1,395	1,559	2,176	6,357	441	98
Listed schools							
1. Alabama	35	48	47	59	189	—	—
2. Harvard	—	—	—	—	—	5	—
3. Massachusetts	12	14	15	33	74	—	—
4. Michigan Mining	25	24	26	33	108	—	—
5. Missouri	29	30	37	34	130	4	—
Total	101	116	125	159	501	9	—
Nonlisted schools							
1. Connecticut	10	22	11	25	68	—	—
2. Louisiana Polytechnic	31	23	34	26	114	—	—
3. New Hampshire	38	33	18	18	107	—	—
4. Oklahoma	25	26	32	40	123	—	—
5. Tennessee	6	5	5	2	18	—	—
6. Texas	18	9	15	17	59	—	—
7. Washington State	29	38	17	38	122	—	—
Total	157	156	132	166	611	—	—
GRAND TOTAL	1,485	1,667	1,816	2,501	7,469	450	98

The peak enrollment in the junior class, 2,497, was reached last year and is higher by 681 than the 1,816 enrolled in 1949. Yet this 1,816 is the second highest figure ever reported for the junior class. The number should drop to some 1,500 next year.

The sophomore class has a total of 1,667 enrolled, a drop of 511 from the 2,178 of last year. A decrease in this class has taken place for each of the past two years. A further decline to between 1,400 and 1,500 may be expected next year. Reference to Table 6 will show that the current enrollment of sophomores is the lowest of the past four years, and approximately the same as the numbers reported during the previous peak years of 1935 to 1938. It is significant that the 1,667 in the sophomore class is 184 fewer than the 1,851 freshmen reported a year ago. This means that a normal decrease is taking place as the classes move ahead, and that the irregular trends caused by numerous transfers from other colleges are apparently not to continue.

TABLE 5.—UNDERGRADUATE ENROLLMENTS AT SCHOOLS OF FORESTRY IN THE UNITED STATES, 1903-1904 TO 1949-1950

Year	Enrollments	Year	Enrollments
1903-1904	19	1926-1927	1,880
1904-1905	39	1927-1928	1,957
1905-1906	51	1928-1929	2,079
1906-1907	98	1929-1930	2,123
1907-1908	143	1930-1931	2,120
1908-1909	258	1931-1932	2,573
1909-1910	357	1932-1933	2,388
1910-1911	518	1933-1934	2,246
1911-1912	591	1934-1935	3,791
1912-1913	637	1935-1936	5,406
1913-1914	868	1936-1937	6,032
1914-1915	904	1937-1938	6,067
1915-1916	944	1938-1939	5,144
1916-1917	897	1939-1940	4,487
1917-1918	560	1940-1941	3,763
1918-1919	498	1941-1942	2,881
1919-1920	927	1942-1943	2,326
1920-1921	1,092	1943-1944	503
1921-1922	1,363	1944-1945	571
1922-1923	1,347	1945-1946	1,473
1923-1924	1,439	1946-1947	7,010
1924-1925	1,624	1947-1948	7,454
1925-1926	1,771	1948-1949	8,212
		1949-1950	7,469

In the freshman class are enrolled 1,485 students, 366 fewer than the 1,851 of last year. The figures in this class show successive declines during each of the past three years. This figure of 1,485 is 2,126 smaller than the peak of 3,611 which occurred three years ago; also it is considerably smaller than the freshmen enrollments of any of the three years 1935 to 1937, a previous period of maximum enrollments. The number to enroll next fall is purely a matter of conjecture. It seems doubtful if more than 1,500 new students may be expected.

The statistics of freshman enrollments are never too satisfactory. Some schools, for example California, Colorado, and the University of Michigan, usually report only limited numbers of first year men or none at all. Also a few schools report only limited numbers of sophomores. However, the same schools each year follow

TABLE 6.—UNDERGRADUATE FALL TERM ENROLLMENTS BY CLASSES IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1933-1934 TO 1949-1950

Academic years	—Freshmen— Enrollment	Change	—Sophomores— Enrollment	Change	—Juniors— Enrollment	Change	—Seniors— Enrollment	Change	—Totals— Enrollment	Change
1929-1933 averages	773		597		476		398		2,244	
1933-1934	783		628		467		368		2,246	
1934-1935	1,751	+ 968	930	+ 302	671	+ 204	439	+ 71	3,791	+1,545
1935-1936	2,301	+ 550	1,587	+ 657	943	+ 272	575	+ 136	5,406	+1,615
1936-1937	2,044	— 257	1,771	+ 184	1,402	+ 459	815	+ 240	6,032	+ 626
1937-1938	1,919	— 125	1,656	— 115	1,378	— 24	1,114	+ 299	6,067	+ 35
1938-1939	1,403	— 516	1,235	— 421	1,294	— 84	1,212	+ 98	5,144	— 923
1939-1940	1,259	— 144	1,095	— 140	922	— 302	1,141	— 71	4,487	— 657
1940-1941	1,000	— 259	975	— 120	857	— 135	931	— 210	3,763	— 724
1941-1942	771	— 229	672	— 303	709	— 148	729	— 202	2,881	— 882
1942-1943	845	+ 74	580	— 92	404	— 305	497	— 232	2,326	— 555
1943-1944	199	— 646	94	— 486	101	— 303	109	— 388	503	—1,823
1944-1945	321	+ 122	114	+ 20	64	— 37	72	— 37	571	+ 68
1945-1946	840	+ 519	315	+ 201	205	+ 141	113	+ 41	1,473	+ 902
1946-1947	3,611	+2,771	1,840	+1,525	914	+ 709	645	+ 532	7,010	+5,537
1947-1948	2,061	—1,550	2,878	+1,038	1,577	+ 663	938	+ 293	7,454	+ 444
1948-1949	1,851	— 210	2,178	— 700	2,497	+ 920	1,686	+ 748	8,212	+ 758
1949-1950	1,485	— 366	1,667	— 511	1,816	— 681	2,501	+ 815	7,469	— 743

the same policies of reporting freshmen and sophomores, and for comparisons with the data for previous years the tables are satisfactory.

In direct contrast to the normal distribution of students in the four undergraduate classes, the total in Table 6 shows the largest enrollment in the senior class with progressively smaller registrations in the junior, sophomore and freshman classes. A reverse of this order will not occur until some three or four years have passed.

A small number of women are enrolled, 6 undergraduates and 1 graduate. Of the undergraduates 1 is a freshman at Purdue, 1 is a sophomore at Montana, 2 are juniors (1 each at Colorado and Purdue), and 2 are seniors (1 each at the University of Michigan and the New York State College of Forestry). Also at the latter institution is 1 woman registered for the master's degree.

Graduate Enrollments

Candidates for the master's degree total 450, an increase of 120 over the 330 reported in 1948. This is the largest number ever reported in this group, the previous maximum having been 376 in 1946-1947. There is little basis for predicting future trends, but in view of the large number of men to complete their undergraduate work in June 1950, it appears that the current year's figure of 450 may be even larger next year.

Of the 450 reported, 441 were listed from 21 of the 22 accredited schools. Yale leads with 60, the New York State College of Forestry is second with 59, the University of Michigan is third with 50, and Duke is fourth with 48, the total for these four schools being 217. Other schools with the larger numbers of candidates for the master's degree are Michigan State College with 33, Utah with 28, the University of Washington with 25, and California with 24; these four schools have a total of 110. Thus at 8 schools are 327 candidates for master's degrees, 73 percent of the total number of 450.

TABLE 7.—FALL TERM ENROLLMENTS OF GRADUATE STUDENTS IN SCHOOLS OF FORESTRY IN THE UNITED STATES FOR THE YEARS 1931-1932 TO 1949-1950

	Master's	Doctor's	Total
1931-1932	173	26	199
1932-1933	174	32	206
1933-1934	80	37	117
1934-1935	104	18	122
1935-1936	114	25	139
1936-1937	151	28	179
1937-1938	150	34	184
1938-1939	253	40	293
1939-1940	213	34	247
1940-1941	212	39	251
1941-1942	137	45	182
1942-1943	30	24	50
1943-1944	30	7	37
1944-1945	20	10	30
1945-1946	108	16	124
1946-1947	376	49	425
1947-1948	339	80	419
1948-1949	330	93	423
1949-1950	450	98	548

Enrolled for the doctorate are 98 men at 8 schools. The New York State College of Forestry reports 25 candidates, and the University of Michigan and Yale each report 20, Minnesota reports 10, Michigan State 9, California and Duke 6 each, and the University of Washington 2.

Enrollment of Veterans

In 1949, 8,017 men and women were studying at the schools of forestry. Of these, 7,469 or 93 percent, were undergraduates, and 548, 7 percent, were graduate students. Last year the comparable percentages were 95 and 5. Of the 8,017, 8,010 were men; 7 were women.

Of the 7,469 undergraduates, 4,591, 61 percent, were veterans; of the 548 graduates, 450 or 82 percent, were veterans. Last year 75 percent of the undergraduates and 77 percent of the graduate students were veterans.

The summaries presented in Tables 8, 9, and 10, which deal with veteran and nonveteran enrollments, are not exactly correct, since Colorado failed to differentiate between the two groups, and all figures supplied were placed in the columns for veterans. If a breakdown of the statistics supplied from this school had been possible, the percentages for veterans in each group would be slightly lower than those tabulated.

The percentage of veterans in the undergraduate classes was at its peak in 1946-1947; during that year 88 percent were veterans. In 1947 the comparable figure was 80, in 1949, 75, and this year, 61. Undoubtedly, this trend will continue and in another year nonveterans

TABLE 8.—ENROLLMENTS OF VETERANS AND NONVETERANS AT SCHOOLS OF FORESTRY IN THE UNITED STATES FOR FALL TERM 1949-1950
Special Students Excluded

	Undergraduates		Graduates		Total	
Accredited schools	Veterans	Non-veterans	Veterans	Non-veterans	Men	Women
1. California	139	91	28	2	271	
2. Colorado	197	1	7		204	1
3. Duke			48	6	54	
4. Florida	212	64	11	1	288	
5. Georgia	175	78	10		263	
6. Idaho	119	122	4	7	252	
7. Iowa	199	118	4		321	
8. Louisiana	122	44	8	4	178	
9. Maine	166	83	4		253	
10. Michigan University	172	108	56	14	349	1
11. Michigan State	242	307	42		591	
12. Minnesota	212	145	20	6	383	
13. Montana	228	91	3		321	1
14. New York	365	384	63	21	831	2
15. North Carolina	164	74	6		244	
16. Oregon	261	117	8	1	387	
17. Pennsylvania	235	145	11	2	393	
18. Purdue	137	113	7		155	2
19. Utah	234	116	22	6	378	
20. Washington University	223	102	17	10	352	
21. West Virginia	149	85			234	
22. Yale	7		64	16	87	
Total	2,969	2,388	443	96	6,889	7
Listed schools						
1. Alabama	101	88			189	
2. Harvard			3	2	5	
3. Massachusetts	47	27			74	
4. Michigan Mining	60	48			108	
5. Missouri	87	43	4		134	
Total	295	206	7	2	510	
Nonlisted schools						
1. Connecticut	56	12			68	
2. Louisiana Polytechnic	66	48			114	
3. New Hampshire	46	61			107	
4. Oklahoma	70	53			123	
5. Tennessee	2	16			18	
6. Texas	28	31			59	
7. Washington State	59	63			122	
Total	327	284			611	
Grand totals	4,591	2,878	450	98	8,010	7

TABLE 9.—VETERAN AND NONVETERAN ENROLLMENTS CLASSIFIED BY UNDERGRADUATE AND GRADUATE GROUPS FOR YEARS 1947-1948 TO 1949-1950

	1947-1948		1948-1949		1949-1950	
	Number	Percent	Number	Percent	Number	Percent
Undergraduates	7,454	100	8,212	100	7,469	100
Veterans	5,574	80	6,199	75	4,591	61
Nonveterans	1,480	20	2,013	25	2,878	39
Graduate students	419	100	423	100	548	100
Veterans	345	82	325	77	450	82
Nonveterans	74	18	98	23	98	18

TABLE 10.—THE NUMBER OF VETERAN AND NONVETERAN GROUPS IN UNDERGRADUATE AND GRADUATE CLASSES 1949-1950

			Nonveterans			
Class	Veterans	Percent	Men	Women	Percent	Total
Freshmen	415	28	1,069	1	72	1,485
Sophomores	860	52	806	1	48	1,667
Juniors	1,236	68	578	2	32	1,816
Seniors	2,080	80	419	2	20	2,501
	4,591	61	2,872	6	39	7,469
Masters	372	83	77	1	17	450
Doctors	78	80	20		20	98
Total	5,041	63	2,969	7	37	8,017

will probably make up at least half of the undergraduate student body.

The percentage of veterans enrolled for graduate studies was almost the same for both 1946-1947 and 1947-1948, 83 and 82 percent respectively. In 1948-1949 the figure dropped to 77 percent, but this year it is up again to 82 percent.

The proportion of veterans enrolled in the four undergraduate classes and as candidates for graduate degrees continues to be of interest. The numbers of both veterans and nonveterans classified in the various categories are presented in Table 10.

In the freshman class only 28 percent are veterans. The comparable figure in 1948 was 52 percent and in 1947, 60 percent. In the sophomore class 52 percent are veterans as compared with percentages of 70 in 1948, and 85 in 1947. Although veterans still make up the larger part of both the junior and senior classes, the percentages as compared with those of the past two years show downward trends. Of the total enrollment of juniors the percentages of veterans for 1949, 1948, and 1947 respectively are 68, 87, and 88. In both 1947 and 1948, veterans make up 91 percent of the senior enrollments. In 1949 the percentage of veterans in the senior class is 80.

There is little change in the percentages of veterans in the group registered for master's degrees. In 1947 the percentage of veterans in this group was 83, in 1948, 80, and in 1949, 83. Of those registered for the doctorate in 1947, 71 percent were veterans; in 1948, the percentage was 75, and in 1949 it is 80.

At the present time the 5,041 veterans make up 63 percent of all students, graduates and undergraduates, at the schools of forestry. In 1948 there were 6,524 veterans, or 76 percent of the total of 8,635 for that year. In 1947 there were 6,319 veterans or 80 percent of the total of 7,873. Thus the proportion of veterans at the schools is gradually decreasing. Another year should see this percentage drop below 50.

Reclaiming Appalachian Brush Lands For Economic Forest Production[1]

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SOME THREE MILLION acres of southern Appalachian mountain lands are now occupied by stands of laurel (*Kalmia latifolia*, L.) and species of rhododendron (mostly *Rhododendron maximum*, L.). The showy blossoms are a tourist attraction along the highways and in the more accessible places for a short period each summer. Such considerations involve perhaps a few hundred thousand acres. The problem consists of vast and relatively inaccessible areas of former commercial forest now captured by shrubs. Often there is a remnant of the original forest left as a ragged overstory of worthless or low-value trees. The shrubs are tolerant of shade, can occupy the space under residual trees, and are able to persist. Their growth is slow, but their advanced start gives them an advantage in competition with both sprouts and seedlings of tree species. They often form thickets so dense as to preclude any natural regeneration of timber trees (Fig. 1). Fire normally kills tops only, and alone is an unsatisfactory clearing agent. Some of the burls were used during the war as stock for manufacture of smokers' pipes, but the resultant clearing was insignificant in area. Use as fuel is possible, but improbable where supplies of preferred kinds are plentiful.

In many places where the bushes are not in full possession of the land, they cover cut-over areas only in part or exist solely as an understory. The remaining trees usually include many inferior species and hopelessly defective stems. Here the task of restoring forest values is a dual one involving (1) replacing the shrubs with a new stand of timber trees and (2) improving the composition and growth capacity of what remains of the original stand.

FIG. 1.—Typical rhododendron-laurel thicket.

Experimental Plantations and Methods

Preliminary small-scale tests in Georgia and North Carolina, and later pilot-plant tests in North Carolina, have shown that white pine planted in spots, lanes, or clearings is a promising method of restoring forest to rhododendron and laurel areas. White pine is a native species and its intrinsic quality as a timber tree is firmly established. Its adaptation to brushy sites is assured. It is sufficiently tolerant to survive five years in the shade of sprouts and then grow fast enough to emerge, provided enough of the planting site has been cleared. High initial survival favors emergence in numbers sufficient for a stand. It is also relatively free from disease and insects in the southern Appalachians.

The main purpose of all test plantations was to provide ample plant material to insure fully stocked stands. Quarter- and half-acre test plots soon showed that success hinged upon vertical and horizontal competitive growth rates of pine versus brush. Competition from residual overstory hardwoods was also a factor in areas where insufficient timber-stand improvement-work had been done at the time of site treatment.

Site treatments included (1) complete grubbing, (2) cutting, piling and burning of brush, (3) clearing lanes, and (4) clearing spots. Lane and spot clearings were tried both with and without supplemental grubbing of roots. In the early tests, broadcast burning of standing brush was tried and abandoned. On untreated check plots, white pines failed to produce a stand. All treatments were expensive, small-scale more so than large-scale, and hand more so than machine. Hand grubbing was found exorbitant in relation to its benefits. Without grubbing, pines in spots grew least well; those in lanes were intermediate, and those in complete clearings were tallest (Table 1).

Results and Discussion

The studies show that some pines will emerge naturally, and others will surely need release if they are to survive (Fig. 2). Also, in areas containing many residual cull trees, it often pays to girdle some of them at planting time. Neglect of the timber-stand-improvement phase in site preparation increases the need for liberation cutting in later years.

It should not be hastily con-

[1]Based on test plantations installed on the Toccoa Experimental Forest by E. V. Brender in 1935, on the Pisgah National Forest by A. H. Maxwell in the same year, on the Bent Creek Experimental Forest in 1945 by L. M. James, and recent (1949) work at Bent Creek. For a progress report on this project, see "Planting white pine in laurel and rhododendron 'slicks'," by Leon S. Minckler, Jour. Forestry 39:1036. 1941.

TABLE 1.—FOURTEENTH YEAR SURVIVAL, HEIGHT, AND POSITION OF PINES IN RELATION TO COMPETITION[1]

Site preparation	Basis			Height of Pines			Relation to Brush			
	Number planted	Survival	Number re measured	Average	Over 10 ft.	Over 20 ft.	Emerged		Overtopped	
	Trees	*Percent*	*Trees*	*Feet*	*Percent*	*Percent*	*Percent*	*Feet*[2]	*Percent*	*Feet*[3]
Complete clearing										
Cut, pile, burn	681	64	440	13.0	61	15	42	7	58	10
Cut and grub	495	54	268	14.5	68	19	53	8	47	10
Lanes										
Clear	273	58	157	9.3	40	5	33	6	67	10
Cut and grub	227	60	137	8.9	34	4	26	5	74	9
Spots										
Clear	264	61	161	6.7	17	1	13	4	87	10
Cut and grub	235	63	149	7.8	27	0	23	3	77	10

[1]Condition in February 1949 of eastern white pines planted in the spring of 1935. Result of 14 years' growth on 3 sites (Long Branch, Big Laurel, and Clear Creek, on Pisgah National Forest, North Carolina).

[2]Average distance above adjacent brush. [3]Average distance below brush.

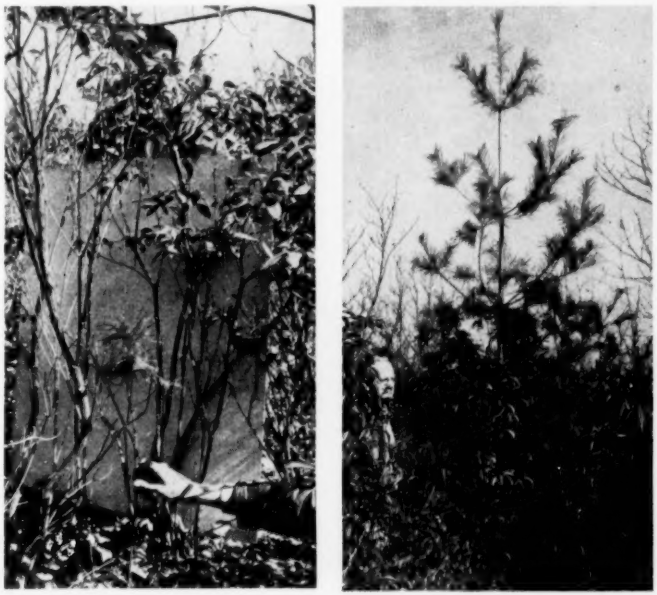
cluded that the most complete form of clearing is everywhere advisable. While it leads to prompt and thorough restoration of a productive forest, it often calls for an excessive financial outlay, particularly without the aid of machines.

In hand work, partial clearing costs less per acre. While it may produce understocked stands yielding less in saw timber, two things may partly offset this tendency. Broadleaf trees and evergreen shrubs make the pines less susceptible to possible damage from insects and disease and more amenable to natural pruning. Partial clearing and planting is preferable where patches of the old forest are worth keeping, and it is clearly the cheapest way of restoring reasonable productivity to idle brush lands.

Partial clearing of pure stands of brush followed by planting can be nearly as effective as complete clearing if properly done. The chance of success depends first of all on the age of the bushes (as estimated from height), and their growth rate in relation to pine.

Our experience shows that pines should be planted in the center of lanes cleared to a width equal to three quarters of the height of the shrubs. For example, in laurel averaging 8 feet tall, lanes should be 6 feet wide. Observation indicates that laurel on such areas is about twenty years old (Fig. 3A), with a mean annual height growth of 0.4 feet. A lateral growth of 0.3 feet each year from each side will close the top of this lane in 11 or 12 years (see arrow, Fig. 3B), but in the meantime the small pines must compete on their own level with the sprouts from cut stumps of laurel. These firmly rooted sprouts are vigorous at first in contrast to planted seedlings. The pines, needing time for establishment, lag behind for a while, but can overtake the laurel sprouts during their first 5 years after planting (Fig. 4). Thereafter the surviving pines can be expected to emerge above the brush (Fig. 5), entering their period of most rapid growth as saplings with a mean annual height growth of about 1.25 feet.

If the thicket is of rhododendron 8 feet tall, it is probably only 15 years old (Fig. 3C). It spreads its crown slightly faster than laurel, closing a 6-foot lane in 11 years (Fig. 3D), but it will take the pines a year longer to catch up with the sprouts from cut stumps of rhododendron. The pines are ex-



A B

FIG. 2.—Eastern white pines 14 years old on the Big Laurel plots, Pisgah National Forest. *A*, hopelessly suppressed; and *B*, successfully emerging.

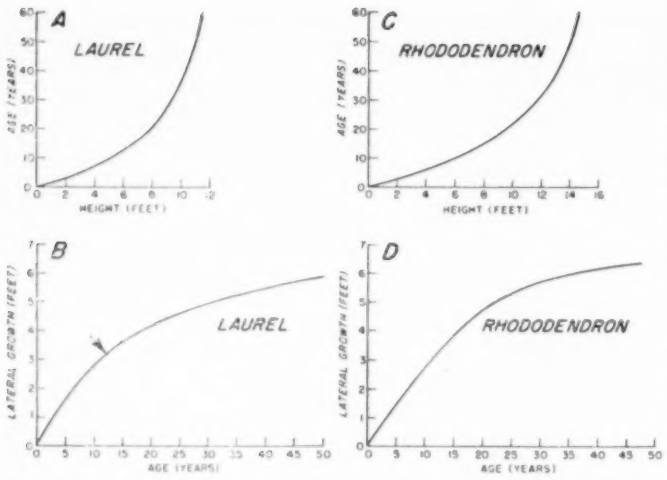


FIG. 3.—The rate at which these shrubs grow or lean toward an open side on an uncrowded site indicates the rate at which lanes or spots of a given width may be expected to close.

FIG. 4.—White pine about 4 feet tall at 5 years in hand-cleared laurel lane on Bent Creek. This tree is a foot above average height.

pected to overtop them after the sixth year (Fig. 5) when both will be 4 feet tall. This leaves the pines 5 years to escape the gradually closing upper edges of the lane. At 11 years the pines should be about 10 feet high. In the meantime, too, the bushes will have grown nearly 3 feet taller, reaching about 11 feet, barely above the pine. During the next 10 years the annual height growth of rhododendron is expected to be about 0.24 feet—only a fifth as fast as pine (1.25 feet). Hence a 1-foot handicap at 11 years is not serious, and successful emergence of the pine is assured.

Clearing and Planting Techniques

On areas not heavily logged or burned, the preparation needed is partial clearing plus some degree of timber-stand improvement for the uncleared portion of the area. The extent of clearing should be adequate but not excessive. Planting of natural openings reduces the amount of clearing needed. Though some of the brush will survive many years as an understory, it will not appreciably affect the development of the overtopping timber trees.

Normally the proportion of cleared to uncleared area will vary from 15 to 50 percent with hand methods, and from 20 to 90 percent with mechanization. With hand methods 15 percent is the bare minimum needed to avoid leaving the land wholly unproductive, while 50 percent permits the development of commercial timber.[2] Within these limits it is suggested that spots be cleared to a width equal to the height of the bushes, or lanes be cleared to three quarters the height of the bushes.[3]

A 25-percent clearing would result from cutting 6-foot spots at 12-foot intervals in rows 12 feet apart. A 50-percent clearing can be had with 6-foot lanes 12 feet apart center to center. Because more extensive hand clearing is usually uneconomic, a tractor is recommended for such clearing on flat or gently sloping land.

In selecting a suitable procedure, the first choice is between hand and machine clearing. Usually a mechanized operation is superior to manual labor. Bulldozers are suitable for either partial or nearly complete clearing of thickets where the slope is less than 40 percent. Steeper gradients are unsafe for tractors. Humus and surface soil are mixed considerably by the blade and tractor tread. Many surface roots are bruised, severed, or pulled out completely. Thus the ground is left in better condition for planting and natural revegetation, while future sprout competition is retarded.

A few words of caution are necessary on what not to do. Fire is useful sometimes to dispose of piled slashings, but do not attempt to use controlled fire in broadcast burning as the sole agent in clearing. During dry periods when fire is most effective, it is too danger-

[2]Clearing lightly and planting about 300 pines will result in a broken stand (useful perhaps for a future supply of seed), but will prolong the brush control problem. Clearing heavily enough to plant at least 500 trees per acre is needed to insure a diminishing brush problem. Twice as many trees must be planted for full production.

[3]These manual techniques were first suggested by Leon S. Minckler in a station paper entitled: "Interplanting of laurel and rhododendron thickets with white pine." U. S. Dept. Agric., Forest Service, Appalachian Forest Experiment Station, Technical Note No. 46, 3 pp., 1941.

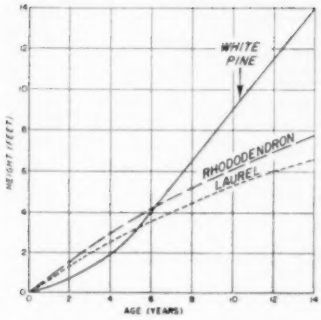


FIG. 5.—Normal rates of height growth of white pine, contrasted with those of sprouts of laurel and rhododendron that had been cut back to the ground. In clearings or lanes sufficiently wide, the pines normally can emerge above adjacent sprouts in 5 or 6 years.

ous; it causes butt-wound injury to desirable young trees without uniformly killing back the laurel; and the behavior of fire is influenced greatly by uncertain weather and fuel conditions. Do not try to replace laurel with white pine on the poorest sites; especially avoid poor sites at elevations above 3,500 feet.

Timber-stand improvement is a necessary adjunct on both cleared and uncleared portions of a brushy area (Fig. 6). It consists of girdling or felling of defective or otherwise undesirable trees to give the planted pines and desirable residual hardwoods a better chance to develop. To dispose of worthless and unmerchantable trees, those under 4 inches in diameter can be felled and the larger ones girdled. A poison such as ammonium sulphamate (Ammate) effectively retards sprouting. The bushes, too, can be killed with chemicals, but the application is likely to be costly and no more satisfactory than ax work. Research in the use of poisons is in progress, but for laurel replacement the elimination of all sprouting is unnecessary. Indications are that chemical herbicides will supplement rather than replace other methods of clearing areas for reforestation.

Essentials of the tree planting operation are these. Plant promptly after treatment, so that seedlings have an equal start with sprouts. Use 2-0 or 1-1 nursery stock from a certified seed source. A moderate investment will often keep the land reasonably productive; a heavier investment is necessary to achieve full stocking and completely utilize the soil. For instance, seedlings can be set roughly 6 by 6 feet, providing 1,089 per acre 90-percent cleared, and 605 per acre 50-percent cleared. In replanting tall brush fields, it is sometimes advisable to plant more than one row of seedlings in the wide lane. For example, 12-foot lanes will accommodate two rows 4 feet apart (605 per acre); 15-foot lanes can have two rows 5 feet apart (484 trees per acre).

When distance between rows is greater than the distance between trees in the rows, costs are usually reduced, because less clearing is necessary, and the work is concentrated in the strip. However, if trees are crowded too close together in the lanes, seedlings are wasted; and if lanes are too far apart, there is a waste of intermediate brush land that will not be reclaimed. When spacing is uniformly 6 by 6 feet, the 1,210 trees per acre promise a reasonably full stocking of merchantable crop trees on cleared areas.

Costs and Returns

Costs of fair-sized operations at the Bent Creek Experimental Forest are shown in Table 2. Hand-labor operations 1 and 2 were applied to a total of 5.1 acres, and resulted in the clearing of 14.5 percent of the total area. It was principally a job of supplementing the stand left after logging. Operation 3 was applied to 6.3 acres, and resulted in the clearing of 43 percent of the total area.

During the spring of 1949 the economy of site preparation through logging was demonstrated on the Pisgah National Forest when 50,000 white pines were planted in reclaiming about 45 acres of brush thicket in the "Pink Beds" area. The planting followed mechanized logging, where tractors skidding logs had made numerous lanes and openings among the bushes. There was no additional clearing. The shipping cost for nursery stock was $1.16 per thousand, or $1.29 per acre. The planting cost for 1,111 pines was $15.12 per thousand trees, or $16.80 per acre. The total per-acre cost of this operation was $18.09.

Planting is a relatively safe investment. The expected returns from planting tractor-cleared areas are shown in Table 3. With 500 trees per acre planted, it is assumed that 63 percent will survive and be harvested in thinnings or in the final cut.

Conclusion

Without artificial aid the chance of getting natural reproduction of timber species in laurel or rhododendron thickets is slight. Laurel replacement can be a profitable enterprise for many timber landowners. Not only government organizations and syndicates, but also private operators, lumber companies, and farmers can plant trees to reclaim the more productive land now occupied by laurel and rhododendron.

Planned preparation of the site is necessary, with two exceptions. Where an accidental fire has been fairly hot, the tops of laurel and rhododendron will have been killed, and trees planted within a year or two after the fire should survive.

FIG. 6.—Bulldozed opening in laurel-rhododendron thicket. The inferior overstory needs timber stand improvement.

By the same token, where tractor logging has cleared numerous openings and lanes, planting soon after logging can succeed.

The eradication of understory brush stands is difficult. As a tolerant understory, these shrubs gradually consolidate their hold on many forest lands without appreciably retarding the growth of the crop trees. Studies show that an effective method of reclaiming brush lands is to plant white pine seedlings in spots or lanes cleared through the rhododendron and laurel. Since success hinges upon competitive growth rates of pine and brush, adequate site treatment is essential before seedlings are planted. Hand clearing may cover less than half of brush areas. Machine clearing may cover more, except where potentially valuable remnants of a former stand are present. In hand work the cutting of spots equal to the height of the shrubs is effective where the bushes are less than 3 feet tall. In taller brush the cutting of parallel lanes three-fourths the height of the brush is suggested. Bulldozers excel in preparing larger openings for planting where terrain is suitable. The cost of clearing with tractor and blade can be as low as one-fourth that of hand methods.

TABLE 2.—COSTS OF SITE PREPARATION AND PLANTING PER ACRE ON A PILOT PLANT SCALE[1]

Operation	Portion of acre cleared	Trees planted	Cost of brush removal and timber-stand improvement	Cost of white pine seedlings (at $2.50 per M)	Cost of planting	Total cost
	Percent	*Number*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
1. Lanes cut	50.0	500	40.80	1.25	14.40	56.45
2. Lanes and spots cut	14.5	176	13.31	.44	4.75	18.50
3. Lanes and openings bulldozed	43.0	512	11.00	1.28	9.20	21.48

[1]All hand labor is computed at 75 cents per man-hour. The bulldozer tractor was used at the rate of $3.25 per hour and a tractor driver at $1.15 per hour.

TABLE 3.—EXPECTED RETURNS FROM PLANTING[1] 512 WHITE PINE PER ACRE ON TRACTOR CLEARED AREAS

Operation	Volume		Stumpage value per cord or per M bd. ft.	Total	Compounded at 3% interest
	Cords	*Bd. ft.*	*Dollars*	*Dollars*	*Dollars*
Thinning, 20th year	2	—	1.50	3.00	9.79
Thinning, 30th year	4	—	1.50	6.00	14.56
Thinning, 40th year	8	—	1.50	12.00	21.67
Harvest cut, 60th year	—	20,000[2]	15.00	300.00	300.00
Total return	14	20,000			346.02
Total cost					106.56[3]
Net return					239.46

[1]Figures are based on actual average growth and returns for several 50- and 60-year-old white pine plantations on the Biltmore Estate near Asheville, N. C. Site consists of previously farmed and abandoned slopes planted with white pine to check erosion.

[2]Based on the assumption that 100 crop trees are harvested, averaging 16 inches d.b.h. and containing 3 merchantable logs, or about 200 board feet.

[3]This figure is derived from the total cost of treating and planting as shown in Table 2. Total cost, $21.48, is compounded at 3 percent for 60 years. Costs of fire protection and taxes are omitted from the total cost, because both are highly variable in different localities.

Forestry in Scotland

The British Council, in association with the Forestry Department of the University of Aberdeen and H.M. Forestry Commission, will hold a course on forestry in Scotland from September 11 to 23, 1950. It will be under the direction of Prof. H. M. Steven, professor of forestry in the University of Aberdeen. During the first four days, there will be lectures in Aberdeen on all aspects of Scottish forestry, followed by a tour by motor coach to forests in north and central Scotland where research and practice in many aspects of Scottish forestry will be seen, including forest nurseries; afforestation of peatlands, upland heaths, maritime dunes; Scottish pinewoods; and use of exotic conifers and hybrid larch.

The course is designed for members of state forest services and of academic and research institutions and those with similar training in the commonwealth and foreign countries. Because there is usually a number of American foresters in Europe each summer, foresters from the United States and Canada are invited to take part in the course.

The cost will be £28 from London back to London. The closing date for applications will be June 11, 1950. Further particulars can be obtained from the Director, Courses Department, British Council, 65 Davies Street, London, W.1.

Wood Quality in Relation to Site Quality of Second-Growth Douglas-Fir[1]

Benson H. Paul

Chief, Division of Silvicultural Relations, Forest Products Laboratory, Forest Service, U. S. Department of Agriculture, maintained at Madison, Wis., in cooperation with the University of Wisconsin.

Summary

SPECIFIC GRAVITY in fully stocked stands of second-growth Douglas-fir averaged lower for site quality II than for site quality IV. Open-grown trees from site II were somewhat lower in specific gravity than the forest-grown trees.

Specific gravity increased as the percentage of summerwood of the growth rings increased. The specific gravity was lower, however, for wide-ringed wood than for narrow-ringed wood having the same percentage of summerwood.

Wood produced in a 100-year stand on site II did not equal old-growth Douglas-fir in average specific gravity until the growth in diameter of the trees had slowed to more than 10 rings per inch when the trees were 60 years of age. In the site IV stand, wood produced after the first 30 years of growth was equal to or above the average for old growth in specific gravity.

Shrinkage values of second-growth Douglas-fir did not show important differences in wood from the two sites, nor in that from various positions in the tree. In general, they were close to similar values for old-growth Douglas-fir.

There was a consistent relationship between specific gravity and strength (modulus of rupture) of second-growth Douglas-fir when results of all tests were considered together. In general, the average strength values of second-growth Douglas-fir from the different sites followed the order of average specific gravity values.

Introduction

The recent interest manifested in growing new crops of Douglas-fir and the appearance on the market of a considerable quantity of lumber cut from second-growth stands have created considerable activity in research to determine properties of second-growth Douglas-fir grown in the United States and in Canada.

During the past three years, studies of second-growth Douglas-fir have been going on at the Forest Products Laboratory and within the past year results of tests made at the College of Forestry, University of Washington, Seattle, Wash.[2, 3, 4] and by the Canadian Forest Products Laboratory, Vancouver, B. C.[5] have been reported.

The purpose of this paper is to present some of the results of the detailed studies at the U. S. Forest Products Laboratory based on material selected specifically from stands representing the two quality classes of sites II and IV. Because of the need for brevity in this paper, discussion will be limited closely to specific gravity variations and factors influencing them. A need for going farther into a discussion of various mechanical properties at this time becomes less evident since the relationship found between specific gravity and modulus of rupture (bending strength) proved to be an almost exact replication of a similar relationship established on a basis of tests from old-growth trees made more than twenty-five years ago. The important differences, therefore, between old-growth and second-growth Douglas-fir are evident in the relative location of the bulk of the specific gravity data for second-growth within the range of the total specific gravity variation of the species.

Material Tested

Thirty-three trees selected for this study were taken from forests of site qualities II and IV, located in the Willamette National Forest, Lane County, Oreg.

Fourteen trees ranging from 14-36 inches in diameter at breast height from a 100-year forest-grown stand and five trees of 23-34 inches d.b.h., 65-70 years old, from an open understocked stand represented site quality II.

Fourteen trees ranging from 10 to 24 inches d.b.h. from a 150-year old stand represented site quality IV.

The most noticeable difference in the soils of the two sites was a preponderance of gravel in the surface soil layers of site IV. Natural drainage on all three areas was good.

The material investigated for specific gravity and shrinkage came from cross sections taken at approximately 20-foot intervals throughout the merchantable length of these trees. In the specific gravity study, comparisons were made of wood produced during the last 40 years and during preceding 40-year periods (Fig. 1). The results of strength tests shown in Figure 2 are for material from the 8-to 16-foot level above the stump, tested in the green condition.

Results of Tests

Specific Gravity and Shrinkage in Volume

The weight and volume of specific gravity specimens were recorded for material in the green condition and again after drying to a moisture-free condition. From this information specific gravity based upon oven-dry weight and green volume, and upon oven-dry weight and oven-dry volume, was obtained. Differences in volume of specific gravity specimens when green and over-dry gave the shrinkage in volume. The specific gravity values used in this report

[1] Presented at the meeting of the Division of Silviculture, Society of American Foresters, Seattle, Wash., October 12, 1949.

[2] Schrader, O. Harry, Jr. Some strength properties of second-growth Douglas-fir. Proceedings, National Research Council Symposium on Wood. June 1949. (In press.)

[3] Schrader, O. Harry, Jr., J. W. Allen, and W. G. Hughes. Univ. of Wash. The Trend in Engineering. April 1949.

[4] Wangaard, Frederick F. and Eugene V. Zumwalt. Some strength properties of second-growth Douglas-fir. Jour. Forestry 47:18-24. 1949.

[5] Alexander, J. B. Physical and mechanical properties of second-growth Douglas-fir. Proceedings, American Society for Testing Materials. 1949. (In press.)

include only those based upon weight when oven-dry and volume when green.

The average specific gravity values for the merchantable length of second-growth Douglas-fir for open- and forest-grown trees on site quality II were 0.41 and 0.43, respectively; and for forest-grown trees on site quality IV, 0.46. In previous tests of old-growth, coast-type Douglas-fir, the average specific gravity was 0.45.[6] Thus, the wood from site quality II averaged slightly below, and that from site quality IV slightly above, the old-growth. Maximum and minimum individual specific gravity values of 0.57 and 0.32 occurred in the forest-grown trees of site quality II, while maximum and minimum values for site quality IV were 0.56 and 0.37. Extreme values for the open-grown trees of site II were 0.48 and 0.35. On both sites the minimum specific gravity occurred close to the pith. However, in any tree the heaviest wood was not always next to the bark. The variations found in samples from the lower 40 feet for the three stands separately and combined are shown in Figure 3.

Except for the last 40 years on site IV, average density increased radially outwards from the center of the trees. Density decreased somewhat from the butt to the top of the trees, the maximum being at the base. Considering only the first 100 years for both forest-grown stands from stump level to 60 feet above stump, the trees from site quality II showed less variation in specific gravity with height in tree, although maintaining a lower average specific gravity; whereas, at stump level, trees from site quality IV showed less variation in the radial direction than those from site quality II. It appears that specific gravity variation in the radial direction may be influenced somewhat by density of stocking, since on site II the slowly-grown trees produced heavier wood than the faster-grown trees progressively toward the bark.

[6] Markwardt, L. J. and T. R. C. Wilson. Strength and related properties of woods grown in the United States. U. S. Dept. Agric. Tech. Bull. 479.

Data on specific gravity of second-growth Douglas-fir representing two shipments of six and seven trees, respectively, and totaling 303 specimens from the Canadian Forest Products Laboratory, Vancouver, B. C. corresponded closely to data from site II trees with respect to total specific gravity range, average specific gravity, and specific gravity gradient from the center of the trees outward.

Schrader[2] shows specific gravity and strength values (averaging below that of old growth) for four trees of site quality I and six trees of site quality II, with average rings-per-inch values of 4.4 and 5.2 respectively, and specific gravity and strength values approximately equivalent to old growth for six trees averaging 8.1 rings per inch from site quality III.

Schrader, Allen, and Hughs[3] found the specific gravity to be directly proportional to the num-

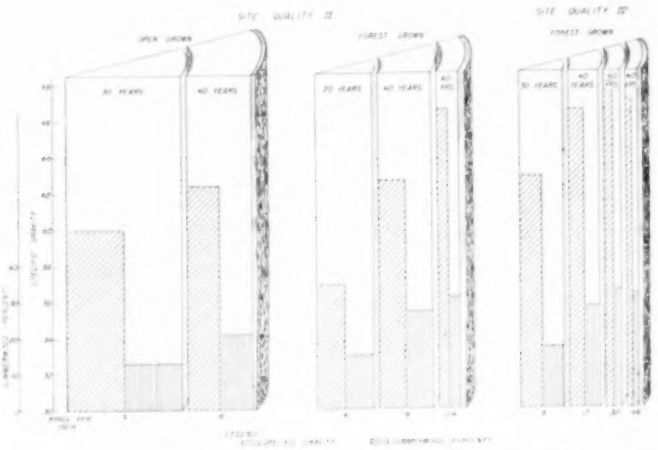


Fig. 1.—Diagrams showing average ring width (rings per inch), specific gravity, and percentage of summerwood for comparative age periods in second-growth Douglas-fir from sites II and IV. The data represent material taken at a height of approximately 20 feet in the trees.

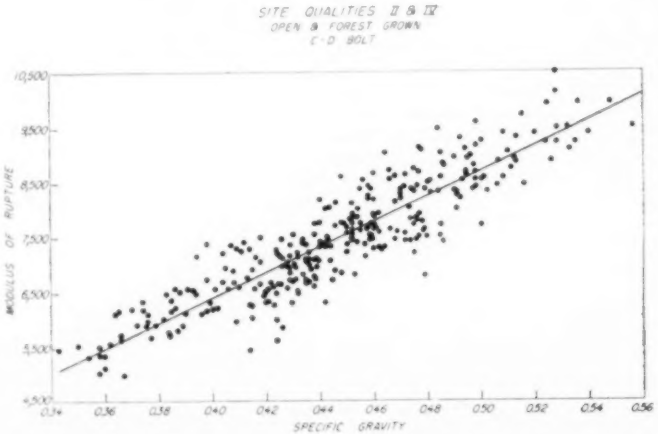


Fig. 2.—Relationship of modulus of rupture to specific gravity of specimens for second-growth Douglas-fir obtained from site qualities II and IV.

ber of rings per inch over a range of 3 to 10 rings per inch. They reported the quality of the cell-wall material, as formed during growth, to be strongly influenced by site, and stated that higher specific strength—the modulus of rupture divided by specific gravity—resulted on the more fertile sites.

Wangaard and Zumwalt [4] in an analysis of three trees, one each from sites II, III, and IV, obtained increasing specific gravity and strength data from near the center of the tree outward. Except for an inner zone of 25-33 years, each of the three trees gave specific gravity and strength values equal to or above the average for old growth. The rings per inch for the respective trees and tests show that the trees of sites II and III were of somewhat slower growth than those reported by the other workers.

Summerwood

The proportion of summerwood to springwood is sometimes used as a visual index of density. Since summerwood ordinarily is much heavier than springwood, and correspondingly stronger, a timber containing a large proportion of summerwood is expected to have greater strength than one in which less summerwood occurs.

Careful measurements of the percentage of summerwood were made for all the specific gravity samples at the 20-foot level in the trees. Figure 1 includes the average summerwood content of the open-grown and of the forest-grown trees on the two site qualities by age periods at the 20-foot level.

In general, there is a close correlation of variation in summerwood with variation in specific gravity. An exception to this is evidenced by a relatively high percentage of summerwood for the wide-ringed wood of low specific gravity on site quality II, in comparison to more slowly grown wood with an equal percentage of summerwood but a much higher specific gravity at a corresponding age on site IV. This exception is attributed to lower density of the summerwood in the wider growth

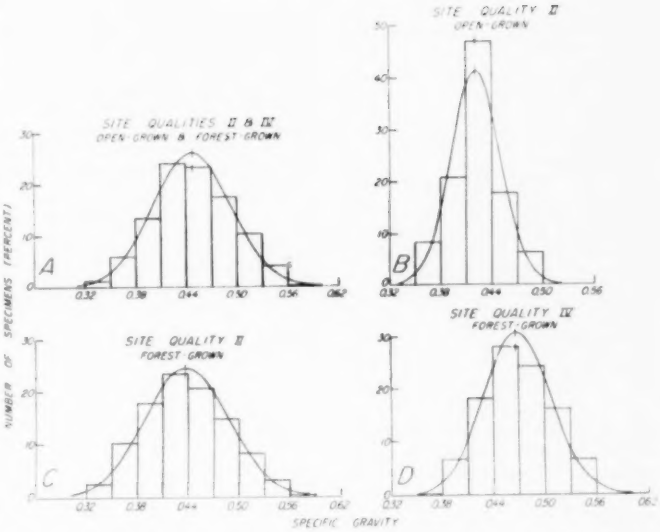


Fig. 3.—Frequency distribution of specific gravity values of second growth Douglas-fir in comparison with a normal distribution based on mean and standard deviation of the data. *A*, site qualities II and IV, open grown and forest-grown trees. *B*, site quality II, open grown trees. *C*, site quality II, forest grown trees. *D*, site quality IV, forest-grown trees. Highly significant differences between average values were found between *B* and *C* and *C* and *D*.

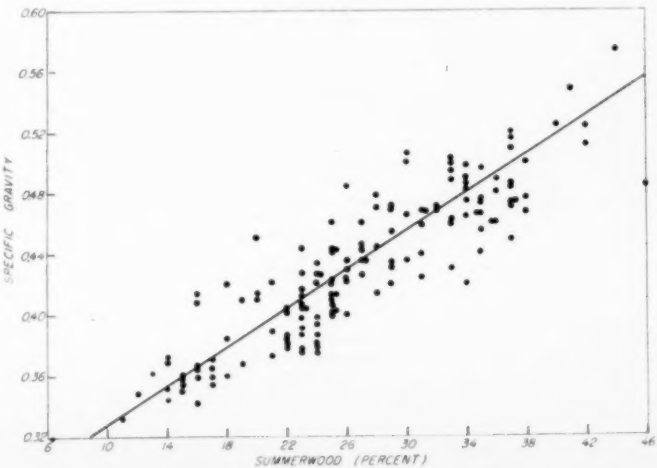


Fig. 4.—Relationship of specific gravity to summerwood percentage of specimens cut 20 feet above stump in forest-grown trees from site II.

rings, although studies of the variability of its density have not yet been made. The percentage of summerwood of this second-growth Douglas-fir satisfied the one-third requirement of the density rule[1] only for the 60- to 100-year period on both sites.

The relationship of specific gravity to the percentage of summerwood in the cross section is shown in Figure 4 for measurements at 20 feet above the stump.

It may be interesting to note that the open-grown trees showed the lowest average percentage of summerwood and the fewest rings per inch for the initial growth periods, while the forest-grown trees from site quality IV showed the highest average percentages of summerwood and the greatest number of rings per inch. Summerwood, however, decreased in wood of extremely slow growth in the trees of smaller diameter from the latter site (Fig. 1). It is possible that, if the stands had been thinned at 70 to 80 years, the effect would have been to increase the percentage of summerwood in the wood formed later.

Average volumetric shrinkage values for the specific gravity specimens when dried to a moisture-free condition showed only slight differences in the three stands. The open-grown site II stand averaged 1.2 percent lower than wood from the forest-grown stands, which averaged the same, 12.6 percent. The greatest range in shrinkage, 7.8 to 18.3 percent, was found in the forest-grown stand of site II.

The analysis of specific gravity of second-growth Douglas-fir from sites II and IV shows, first, that on site II in both the open and the fully stocked stands the wood of more rapid growth (3 to 10 rings per inch) was lower in specific gravity than the average of old-growth Douglas-fir. On this site the specific gravity of the wood did not equal that of old growth until after the stand was 60 years old. From this fact it appears that, if forest conditions had been such that initial diameter growth of the trees had been retarded, the specific gravity might have been increased. This phase of the investigation requires additional study in order to determine to what extent this can be accomplished in the silvicultural management of stands on the better-quality sites.

On site IV initial growth in diameter of the trees was considerably slower than on site II. The wood produced initially on site IV was close to the old growth in average specific gravity. It equalled the old-growth figure at a much younger age than in the trees on site II, and maintained a specific gravity value well above the average for old growth during the remainder of the tree's life, even though growth was greatly curtailed and the specific gravity was decreased somewhat during the last 40 years by severe crowding. Doubtless, a thinning in this stand 50 to 75 years earlier would have produced larger trees of more uniform wood quality throughout.

[1] Rules for estimating the density of wood based upon the percentage of summerwood and rate of growth. The rules at present apply only to southern yellow pine and Douglas-fir, for which they differ slightly.

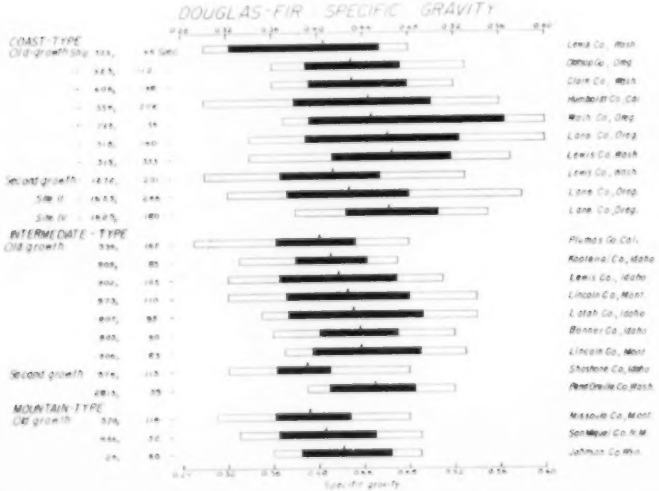


Fig. 5.--Comparisons of specific gravity variations for shipments of old-growth and second-growth Douglas-fir from a number of locations within the natural range of the species. The short vertical line indicates the average, the solid bar the range of the middle 75 percent of the values, and the open bars indicate the extremes of range for each shipment.

Conclusions

Taking a broad view of the site quality-specific gravity relationship for second-growth Douglas-fir, one sees that the trend is an approach to old-growth quality (specific gravity) as one goes from rapid to slower growth within a tree or as one goes from stands of higher to those of lower site index.

Looking far into the future, one may forecast a general depreciation of specific gravity values in coast-type second-growth stands of 100 years or less in comparison with the predominating values of old growth on the better sites. To offset this, it is possible that forest management practices can establish a growth rate, during the early formation of stands, that will produce wood of relatively high initial density on the better sites. Indications now are that this can be accomplished at about 10 rings per inch or more. Without such silvicultural control it seems possible to visualize a future disappearance of the distinction that has existed for so long between the coast-type and in-

land-type Douglas-fir. Some indications of this may be seen in Figure 5, which shows the specific gravity ranges of both old-growth and second-growth Douglas-fir in a number of specific localities throughout the range of the species.

Other Publications

There follows a brief list of Forest Products Laboratory publications on other aspects of second-growth Douglas-fir.

Fleischer, H. O. 1949. Suitability of second-growth Douglas-fir logs for veneer. Jour. Forestry 47:533-537.

Paul, Benson H. 1947. Lumber grades vs. site quality of second-growth Douglas-fir. Forest Products Laboratory Report No. R1688.

———. 1947. Knots in second growth Douglas-fir. Forest Products Laboratory Report No. R1690.

Pillow, M. Y. 1949. Variations in longitudinal shrinkage of second-growth Douglas-fir. Jour. Forestry 47:383-391.

Induced Snow Drifting for Water Storage

H. W. Lull and H. K. Orr

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If water in the form of snow drifts can be stored on watersheds some of the critical limitations of western irrigation agriculture may be overcome. The authors present the results of preliminary investigations on natural and artificial drifting of snow together with suggestions as to how induced drifting may improve the usefulness of runoff.

IN MANY parts of the West, where runoff comes largely from snow, overabundance of early summer stream flow from snow melt followed by a water shortage in late summer constitutes a serious handicap to irrigation agriculture. This handicap is especially serious in central Utah where many argicultural lands are liable to a water shortage after July 1. The narrow, high-gradient drainages which carry water directly to the farming areas do not provide favorable reservoir sites, thus precluding solution of the problem by construction of storage dams.

A possible solution to this problem may be prolonging the snow melting period by induced snow drifting, which, in effect, would provide water storage on the watershed. This is not a new idea. As early as 1912 Church [1] proposed storing snow to control stream flow.

Some years later, water users at Ephraim, Utah, constructed drift fences in the headwaters of Ephraim Canyon with a view toward trapping snow that normally blows into another basin. This project was short-lived and yielded no records on the effects of the drift fences.

Further study was made of the feasibility of prolonging snow melt by induced drifting in the subalpine zone of the Ephraim Creek watershed in 1947 and 1948. Results of these observations and tests are herein reported, together with suggestions concerning possible effects of drifting on stream flow.

Ephraim Creek Runoff

Ephraim Creek, with headwaters in the subalpine zone near the crest of the Wasatch Plateau, drains successively lower vegetal zones—aspen-fir and oakbrush—until it reaches the sagebrush zone at the foot of the watershed. Precipitation in the watershed varies with altitude, the sagebrush zone (5,500-6,500 feet) averaging 10.9 inches annually, oakbrush (6,500-7,800) 20.1 inches, aspen-fir (7,800-9,500) 29.5 inches, and the subalpine zone (9,500-10,200) 32.2 inches.[2] Runoff is greatest from the upper two zones: comprising 58 percent of the area they produce 83 percent of the runoff. Ninety-five percent of the stream discharge from the subalpine zone comes from melted snow, 5 percent from summer-storm rainfall.[3]

During the fall and winter months, discharge from the Ephraim Creek watershed is fairly constant, averaging 10 to 15 acre feet per day. Snow melt beginning in mid-April increases the rate of discharge until by approximately late May or early June a peak of about 400 acre feet per day is reached. Recession from this peak is rapid: discharge drops to approximately 100 acre feet per day by July 1 and by September 1 it is down to 10 to 15 acre feet per day. This distribution results in an oversupply of irrigation water in April and May, about equals June requirement, and does not provide nearly enough water for the full utilization of cropland during the main growing season.

Opportunities for obtaining a more equitable distribution of runoff for irrigation by induced snow drifting are most abundant in the subalpine zone. Deep winter snows—the first requisite for drifting—occur here. Strong, single-directional winds—a second requisite—are common in this zone throughout the winter. Natural wind bar-

[1] Church, J. E., Jr. The conservation of snow: its dependence on forests and mountains. Sci. Amer. Sup. 74:152-155, 1912.

[2] Lull, H. W. and Lincoln Ellison. Precipitation in relation to altitude in central Utah. Forest Service, Intermountain Forest and Range Exp. Sta. Unpublished.

[3] Forsling, C. L. A study of the influence of herbaceous plant cover on surface runoff and soil erosion in relation to grazing on the Wasatch Plateau in Utah. U. S. Dept. Agric. Tech. Bul. 220. 1931.

riers in the form of well-dispersed alpine-fir clumps occur on about 10 percent of the 3,900 acres within this zone. Substantial drifts annually form to the lee of these natural wind barriers. The remainder of the area is covered by a low-growing stand of herbs and shrubs. Some 2,000 acres of these open lands receive the full sweep of the westerly winds and thus are suitable for artificial drifting.

Fir Clump Drifts

Examination of the fir clumps furnished information on the characteristics of the natural wind barriers that were effective in drift formation. These fir clumps have an average height of 22 feet, length of 60 feet, and width of 32 feet; and contain 75 to 100 branchy trees. Approximately 50 percent of the trees are less than 2 inches d.b.h.; 25 percent are between 2 and 4 inches; 20 percent, 4 to 8 inches; and 5 percent, 8 to 14 inches. Three-inch trees average 34 years of age, 6-inch trees 91 years of age.

Drifts formed to the lee of fir clumps are steep-walled and roughly in the shape of a triangle with the base to the leeward edge of the clump (Fig. 1). From the base, fingers of snow point toward the denser portion of the clump. Ridge lines which extend from these fingers and span the drifts have an average bearing of S. 80° E., defining the prevailing wind direction.

Ten drifts were measured immediately after disappearance of snow from undrifted areas on June 1, 1947. Average snow depths was found to be 3.8 feet with an average water depth of 1.9 feet. The average length of the drifts was 70 feet. Width of drifts varied with the width of the barriers. These drifts lasted from 3 to 4 weeks, with most of them disappearing by June 25.

Five drifts measured in 1948, 6 days after disappearance of snow on the level, had an average water depth of 1.2 feet. At that time water was being released at the rate of 0.15 foot per day. Assuming the same snow-melt rate during the previous 6 days, the earlier water depth would be 2.1 feet, a value comparable to the 1947 depth. One of these five drifts disappeared in 16 days while the remaining four lasted 19 days.

Fig. 1.—Typical fir-clump drift immediately after disappearance of snow on undrifted areas.

The more rapid disappearance of drifts in 1948 is believed to be due to the warmer temperatures of that year. In 1947, drifts persisted for 25 days during which there was a total accumulation of 380 day-degrees of temperature above 32°F. There was a total of 396 day-degrees of temperature during the 19-day period in which drifts persisted in 1948. (Day-degrees for each period is the sum of the average daily temperatures, expressed in degrees above 32°F.) Thus, drifts containing about 2 feet of water appear to remain until about 400 day-degrees above 32°F have been accumulated.

Snow Fence Drifts

In September 1947, four fences were erected in the subalpine zone to determine their effect on drifting. Each fence was 50 feet long. Two of the fences were 7 feet high and two more were 11 feet high. An adjacent area was reserved for check measurements. Fences were constructed by lashing one or two rows of 4-foot slat fence to a rigid frame of aspen poles (Fig. 2).

Snow depth and water content to the lee of these fences and on the check area was measured on April 1 and June 1 in 1948. The 7-foot fences were found to be ineffective for inducing drifting, but substantial drifts were formed behind the 11-foot fences. Table 1 gives measurements of one of these drifts and of the check area.

On April 1 the drift behind the fence contained 20 inches more water depth than the snow on the check area. Density of snow was 8 percent greater in the drift, due, according to Vyssotsky,[4] to the compacted snow particles which are propelled by ground blizzard to the drifting area.

By June 1 snow had disappeared from the check area, but a drift containing 15 inches of water remained behind the fence. This drift persisted until June 12. Thus the 11-foot fence, though only half as high as the average tree barriers, created a drift that contained about 70 percent as much water and lasted about 70 percent as long as those formed behind the fir clump.

Discussion

The similarity of the induced and natural drifts suggests that further drifting may be possible on comparable sites in this and other drainage basins, either by

[4] Vyssotsky, G. N. Shelterbelts in the steppes of Russia. Jour. Forestry 33:781-788. 1935.

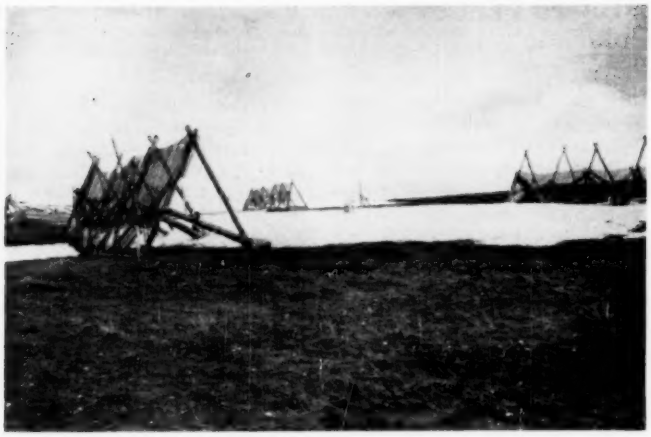

Fig. 2.—Snow fences and drifts. In foreground and center background are the two 11-foot fences. Note absence of drifts behind the 7-foot fences at left and right.

constructing more fences or by developing tree barriers. Several questions need further study, however, to determine the practicability of such an approach as a means of improving the usefulness of stream flow.

The present study did not determine to what extent the drifts were formed by repacking of snow that had already fallen within the basin and by trapping of additional snow that otherwise would blow into another basin. If the drifts were formed solely by a repacking of snow from within the basin, extension of drifts would result in no change in the total runoff from a basin. The delayed melting of the drifts, however, should result in a lowering of the spring peak discharge and in a somewhat stronger flow during the recessional stages of stream flow.

If extension of drifts resulted in the trapping of new snow it is reasonable to expect that the volume of runoff would be increased by the amount of additional water that accumulated in the drifts. The prolonged melting of such drifts would probably result in greater flow during the recessional period but might also increase peak flow discharges.

The actual effects of induced drifting on stream flow remain to be determined. Other questions needing further study are the cost and relative efficiency of different kinds, sizes, shapes, and spacing of barriers. Out of such studies may come practical techniques in watershed management for improving the usefulness of runoff from melting snow.

TABLE 1.—AVERAGE DEPTH AND WATER CONTENT OF SNOW-FENCE DRIFT AND CHECK AREA

Treatment	Date	Snow depth	Water content		Size of drift	
					Length	Width
		Inches	*Inches*	*Percent*	*Feet*	*Feet*
Fence	Apr. 1	93	38	41	100	80
Check	Apr. 1	55	18	33	..	..
Fence	June 1	30	15	50	80	60
Check	June 1	0	0	0	..	..

Beetles Kill Four Billion Board Feet of Engelmann Spruce in Colorado[1]

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IT ALL began in 1939, the aftermath of a number of relatively small blow-down areas in the Englemann spruce stands on the western slope of Colorado. Forest giants were uprooted and others weakened by having been partially uprooted or having their roots injured. The local endemic population of the Englemann spruce bark beetle (*Dendroctonus engelmanni*) made its annual flight a few weeks later or early in July and were attracted to these weakened trees. The result was the beginning of as vigorous and aggressive a crop of beetles as ever fed on a forest. They spread unknown and unhampered by any controls. The war came. The beetles were on the march.

Englemann spruce occupies the high mountain country. It is found from 9,500 feet above sea level to timberline, an elevation of 11,500 to 12,000 feet. Over one-third of the stands is considered inoperable, while less than 25 percent could be classed as easily accessible. It is primarily back country where the beetle has wrecked whole forests.

Since the killed trees stayed green for two years, work of the beetle was hard to discover. By 1942, its increase was tremendous; two years later it was estimated that 90 percent of the trees eight inches and above in diameter was dead on the White River National Forest. At the present time, all the Englemann spruce north of the Colorado River on this forest—about 3½ billion board feet—is dead. In addition, by a 1948 survey, 35 to 50 million board feet are dead on the Grand Mesa National Forest, where the epidemic was first discovered; 74 million on the Routt; 5 million on the Uncompahgre; 291/2 million on the Arapaho; and lesser amounts on the Gunnison and San Juan National Forests.

Entomologists studied the epidemic in 1942. Methods of control which they recommended required men by the thousands; but, with the war on, manpower was at a premium. Foresters were helpless. The possibility of a government salvage program in 1944 and again in 1945 was analyzed but proved impractical, as the short logging season permitted too little use during the war of scarce and vital logging equipment.

The Beetle

In its adult stage the insect is a small, cylindrical, hard-shelled beetle, about ¼-inch in length. When the adults leave the dead trees and start to fly in June and July, they are reddish brown to black in color. They soon settle on recently felled or standing green trees and bore through the outer bark into the living inner bark. This attack extends over most of the lower main stem of the tree.

The beetles work in pairs. The female bores the entrance hole, followed by the male, and the female then bores a tunnel, known as the egg gallery, between the bark and wood. This tunnel usually extends in a vertical direction, paralleling the grain of the wood. As an average there are from 6 to 8 such egg galleries for each square foot of bark. There are usually about 125 eggs in the 3 to 4 groups deposited in each gallery.

After 3 or 4 weeks the eggs hatch. Larvae feed on the succulent inner bark and make tunnels at right angles to the egg gallery. This larval feeding continues throughout the late summer and fall. When winter comes the larvae then still in the inner bark become dormant. The following spring the larvae resume feeding; and, as summer advances, they become mature, transform to pupae, and then to the adult beetle stage. The adult stage is reached by mid-summer, and the beetles first start feeding on the inner bark of the tree in which they were reared. By August or September they appear to be mature.

At this time some of the beetles emerge and congregate under the bark around the base of the same tree; others remain under the bark where they developed. In either case they rest quietly during the second winter; and, when warm weather returns the following spring, they are ready to take flight and attack new living trees.

During this life cycle of the insect, the trees that have been attacked die, usually by the end of the first season of attack. Death results from the girdling by the insect and the action of complemented blue staining fungi that appear to interfere with or stop conduction in the tree. These blue-staining fungi, carried by the beetles, are always found in trees that are successfully attacked by the insects. The foliage of Englemann spruce does not change color until about one year after the trees are attacked; then it fades to a yellowish green, and the needles drop within a short period.

Nature of the Epidemic

Previous outbreaks of the Englemann spruce bark beetle are not unknown. Epidemics are reported to have occurred on the White River National Forest about 1855 and on the Dixie National Forest, Utah, between 1918 and 1928. None of these outbreaks, however, reached the intensity of the present catastrophe.

The Forest Service and the Bureau of Entomology have followed the progress of the beetle in forest officers' observations and by means of project surveys. Sample lines were run through the forests and tallies made of trees with new and old attacks. Small areas in southern and central Colorado were reported at various times to be under attack. These areas caused concern, since it looked as if we

[1] Presented at a meeting of the Division of Silviculture, Society of American Foresters, in Seattle, Wash., October 12, 1949. The entomological information is based on studies since 1943 by Dr. Noel D. Wygant and staff, Bureau of Entomology and Plant Quarantine, Fort Collins, Colo.

had a lot of spot infections that might spread. Fortunately, this spread did not take place; the center of attack remained north of the Colorado River on the White River National Forest.

The early surveys indicated no mass flight across wide valleys or areas where spruce was missing. That optimistic observation was shattered in the past few years, when the beetle crossed in vast numbers to the old Holy Cross area and over the Yampa Valley to the southern part of the Routt National Forest. Another interesting but alarming observation is the report of attacks on lodgepole pine. These attacks have increased as the pressure for food has grown with the practical elimination of their natural host. At first, attacks were light on lodgepole pine but are now heavy enough to kill trees of this species.

The active outbreaks continue on the White River, Arapahoe, and Routt. Beetles are present on the Grand Mesa, Uncompahgre, and Gunnison Forests but seem to be quieting down. Reports are beginning to show them moving into Wyoming. Where they will go or how far is conjectural.

Since the epidemic was first discovered, both foresters and entomologists have been trying to find ways and means to combat the beetles. Known control methods required manpower impossible to obtain during the war, to say nothing about equipment. The expanse of the area under attack, its inaccessibility, and the difficulty in detecting newly attacked trees were, and still are, obstacles to effective control. It was a serious disappointment when the aerial spraying tests conducted on ponderosa pine in the Black Hills in 1947 and in western Wyoming against bark beetles proved unsuccessful. Tests continue as hope springs eternal. Trap tree and trap logs are being tested; new chemicals and their applications tried. Natural enemies of the beetle are at work with much good being done by the native woodpeckers.

Problems of Salvage

The inaccessibility of the timber and the fact that the trees remain usable for saw logs for only 4 to 6 years precluded salvaging much of the killed trees for saw logs or sawed forest products. It had to be in the round or chemically converted to be usable material. A sales campaign in 1946 resulted in interesting some of the Lake States pulp and paper mills in this vast quantity of dead spruce usable for pulpwood. More than 10,000 cords were shipped during 1949. But it was early evident that salvage by existing sawmills and export to the Lake States could make only a small dent in the tremendous quantity available.

Investigations carried out to develop a pulpwood market indicated the necessity of a local plant to process the large volume of dead wood if it was to be used in any quantity. Unfavorable freight rates to existing pulp mills dictated this necessity. It was also determined from recent studies by James L. Mielke, forest pathologist, Bureau of Plant Industry, in Utah, where the same bark beetle had killed stands of spruce timber twenty-five years ago, that the wood remains sound for this length of time and that about 80 percent of the trees still stand.

With the dead timber remaining sound for two decades or more, there is time in which to salvage the killed trees. A local conversion plant could be guaranteed at least a 20-year, and probably a 30-year, supply of dead wood alone. An analysis of the extensive inventory and management plan figures indicates that by using at least 3,000,000 cords of the dead spruce to begin with, there would be sufficient live timber to support a plant on a sustained yield basis at the rate of 115,000 cords per annum. This volume should supply a plant with a daily capacity of 250 tons of ground wood and chemical pulp.

It is true that this is in a high-cost, short-season logging area. Expensive access roads will have to be built. Water must be obtained, treated, and sent back without polluting the streams. These are a few of the problems that must be solved, but present indications are that they can be. They add to the cost and will make the wood somewhat more expensive than it may be in other regions. As compensating factors there are the high freight on finished paper to this mountain territory, and the possibility of supplying the local market to offset the high costs. It is said to be feasible from a competitive standpoint.

As foresters, we fail unless we can harvest and utilize the mature trees. In Colorado, as well as elsewhere in the Rocky Mountains, we have overmature stands of timber, such as the Englemann spruce stands that have been killed by the bark beetles. They have been reservoirs or reserve stands for future cuts. The insects got there first, and they have done a perfect job of clear-cutting. It will be fifty years or more before cutting will be possible on 500,000 acres, more or less. It is a setback to the areas of marginal economic timber that might have soon become economically important and harvested.

If these areas had been cut over and placed in better growing condition in the past, it is doubtful if this tremendous loss would have occurred. However, this was not the case, and until the mature stands are cutover, the forester and entomologist must be ready to locate and immediately control incipient outbreaks of tree destroying insects. Cleanup of windthrown timber to prevent build-up of insect populations is a desirable preventive measure. Better means of detection and survey methods are important, and must be developed.

The Forest Pest Control Act of 1947 should help to make this possible. In the outbreaks in Colorado we hope the beetles will not destroy the stands that are left. From this catastrophe, we may learn how to beat the beetles to the punch the next time.

The Forest Service, on December 22, 1949, advertised 4,500,000 cords of this beetle-killed spruce and some living timber for sale as pulpwood.—Editor.

Discolorations in Living Yellow-Poplar Trees

Elmer R. Roth

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THERE ARE many opinions regarding the cause of discolorations in yellow-poplar trees (*Liriodendron tulipifera* L.). Discolorations are usually more abundant in the butts of older trees and are commonly referred to as "blue-butt" or "mineral stain." Blue-butt is common in yellow-poplar trees in all localities where they grow. Theories regarding the cause of these discolorations include bacteria, minerals from the soil, water standing in open wounds, and metal, such as nails in the trunk. The study reported here was designed to try to determine the causes.

Blue-butt or mineral stain as found in living yellow-poplar trees should not be confused with decay. Decayed wood is usually some shade of brown and is brash rather than splintery when dug out with a pen knife. Strength tests on discolored veneer showed it to be as strong as normal-colored heartwood and sapwood.[1] Decayed wood, however, was significantly weaker than normal. For most ordinary uses mineral-stained yellow-poplar lumber or veneer is comparable to normal wood.

During the study referred to above, many of these discolorations were observed at first hand, both in the mill and on logging operations. Colors observed ranged from light yellow through the greens, reds, purples, blues, and browns. More than 700 isolations were attempted from freshly cut rotary veneer and logs in the 1942 study. More than one-fourth of these isolations yielded bacteria. Very few yielded fungi.

Most of these isolations were from veneer, but some were from freshly felled trees on logging operations. There were no consistent differences between those bacteria isolated from the logs and those from the veneer. Comparison of the bacterial isolates as to size, color, colony consistency, rate of growth, reaction in litmus milk, and Gram characteristics indicated that no particular type of bacteria had been isolated consistently from any given type of discoloration. Most of the bacterial types represented were isolated several times from each type of discoloration and from normal white sapwood and normal green heartwood.

The present study was designed to find out whether we could produce discolorations in living yellow-poplar trees by inoculating them with bacteria, in view of the abundance of bacteria in freshly cut yellow-poplar, or by wounding them mechanically. Accordingly 65 of the more common bacterial isolates from the 1942 study were selected for testing. Ten bacterial mixtures were prepared from these isolates for use in the inoculations. The mixtures were prepared in sterilized test tubes in 10 cc. of distilled water, with a loop of bacteria from 6 or 7 of the isolates in each mixture. A bacterial suspension was formed by agitation.

Second-growth yellow-poplar trees located on the Bent Creek Experimental Forest near Asheville, North Carolina, were used in this study. Only trees 10 inches and larger in diameter at breast height were used. Two trees were inoculated with each bacterial mixture at three selected heights and in addition each tree had a closed and open uninoculated wound. These check wounds had 5 cc. of sterile water added to them. Six additional trees were wounded by mechanical methods.

After the old bark had been removed, and the inner bark sterilized with 70 percent alcohol, holes were bored into the trees, deep enough to reach the heartwood, with either a sterilized increment borer or a brace and bit. After inoculation with 5 cc. of the bacterial suspension, the holes were plugged with sterilized corks or dowels. Two of the holes on each tree were used as controls, one open so it would catch water and the other closed.

In addition, the following types of mechanical wounds were made: (1) ax cut into the heartwood, cut so that it would hold water; (2) ax cut into the sapwood, cut so that it would not hold water; (3) ½-inch

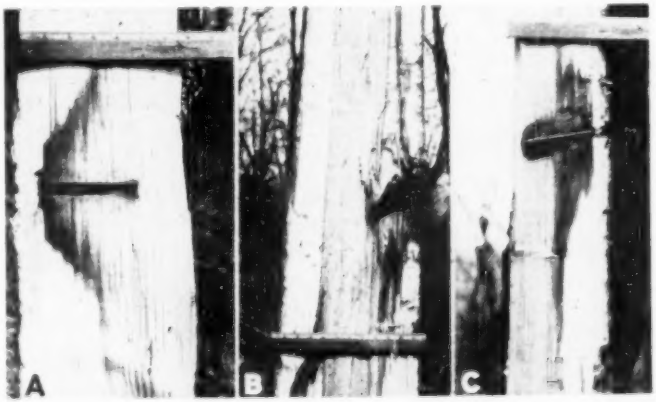

FIG. 1. Discolorations following wounding of living yellow-poplar trees. *A*, Discoloration following inoculation with a bacterial mixture in wounds made with a brace and bit. Extent of discoloration 11 inches. *B*, Discoloration following wounding with an ax, made so that the wound would hold water. Extent of discoloration and decay 40 inches. Note that the decay is almost twice as extensive above as below. This decay was caused by *Polyporus versicolor*. *C*, Discoloration following wounding with 20 penny spike. Extent of discoloration 17.5 inches.

[1]Hepting, George H., Elmer R. Roth, and R. F. Luxford. The significance of the discolorations in aircraft veneers: Yellow poplar. For. Prod. Lab. Release No. 1375. 8 pp. November 1942.

auger hole that would hold water; (4) ½-inch auger hole that would not hold water; and (5) two 20-penny spikes driven on opposite sides of the tree.

After a 5-year period the trees used in this study were felled and the wounds dissected. Growth had closed all wounds, with the exception of those made with an ax. Discolorations from the inoculations (Fig. 1, *A*) ranged from 8.8 inches to 21.1 inches in total length. These discolorations had the same color variations as found in naturally discolored yellow-poplar trees. The average length of discolorations for both the open and the closed checks was slightly more than for the inoculated wounds (Table 1). From these results it is obvious that there is no correlation between the bacteria and the discolorations. Bacteria from other sources, however, may have gotten into these wounds and caused the discolorations. As shown in the results for the closed checks, neither free water nor introduced bacteria are necessary to produce discolorations. However, the presence of free water increased the extent of discoloration where it was present.

Drained ax wounds did not have as much discoloration as those that held water (Table 2). In all cases, however, the large open ax wounds resulted in both discoloration and decay (Fig. 1, *B*). The extent of discoloration for these large open wounds was approximately twice that of the smaller wounds made with a brace and bit. Decay in the open ax wounds was usually preceded by discolorations, and the decay was not very extensive. Decay associated with these wounds was caused by *Collybia velutipes* and *Polyporus versicolor*.[2] Discoloration following wounding by 20-penny spikes was very similar in extent to that following bacterial inoculations and closed check wounds (Fig. 1, *C*).

Results of this study and observations made in connection with it show that the common yellow-poplar discolorations follow wounding. In addition to the discolorations following the types of inoculations and wounding in this study, extensive discolorations have been observed behind broken branches, broken tops, fire scars, insect injuries, bruises, and logging injuries. The inoculations, checks, and mechanical wounds had the same range of colors usually found in naturally discolored trees. The common nondecay discolorations in yellow-poplar probably result from oxidation as in the case of Lorenz's birch stains,[3] rather than from infection by bacteria or fungi.

Table 1.—Extent of Discoloration Following Bacterial Inoculation in Living Yellow Poplar Trees

Method and type	Number of trees	Number of holes	Average length of discoloration	Average width of discoloration	Average depth of discoloration
			Inches	*Inches*	*Inches*
Increment borer:					
Inoculated	10	30	13.6	0.7	3.0
Check open	10	10	18.3	0.7	2.8
Check closed	10	10	15.0	0.7	2.7
Brace and bit:					
Inoculated	10	30	13.9	0.9	3.3
Check open	10	10	22.1	1.0	3.3
Check closed	10	10	14.2	0.9	3.0

Table 2.—Extent of Discoloration Following Mechanical Wounding of Living Yellow Poplar Trees

Method and type	Number of trees	Number of wounds	Average length of discoloration	Average width of discoloration	Average depth of discoloration
			Inches	*Inches*	*Inches*
Ax cuts:					
Holding water	6	6	44.0	5.5	3.6
Drained	6	6	33.2	5.7	3.3
Brace and bit:					
Holding water	6	6	21.6	0.9	2.6
Drained	6	6	11.8	0.9	1.9
Spikes:	6	12	13.1	0.5	2.7

[2]Cultures identified by Ross W. Davidson, Bureau of Plant Industry, Soils, and Agricultural Engineering, Beltsville, Md.

[3]Lorenz, Rolland C. Discolorations and decay resulting from increment borings in hardwoods. Jour. Forestry 42:37-43. January 1944.

The Influence of Insects on Ponderosa Pine Silviculture[1]

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THE LIFE history and general characteristics of forest trees and stands are determined by environmental, climatic, and edaphic factors. In other words, the silvics of any forest type are determined by the interaction of environmental factors on the tree species involved. This law is well recognized by foresters, but how often is it recognized that insects may be the dominant environmental factor which determines the silvics of a forest species?

In the early days, before the American silviculturist arrived on the scene, the ponderosa pine forests of the West grew under the influence of climate, soil, and water. They were thinned and felled by fire, wind, and insects. These were the factors that produced the native ponderosa pine forests as they were found by early settlers. No European or American system of silviculture determined stand structure, density, rate of seeding, or selection of trees to be cut. Yet in spite of this lack of silvical science, nature did a pretty good job and presented American foresters and lumbermen with some 250 billion board feet of ponderosa pine ready for utilization.

In many parts of the ponderosa pine region, bark beetles were nature's principal silvical agent in regulating, thinning, and harvesting the stand. Since the products of their cuttings were not utilized, the waste was tremendous. Billions of feet of merchantable timber have been felled by beetles instead of lumbermen over countless centuries. Even so, the residue at any given time included some excellent-quality pine timber—probably all that the ground would support. What impresses many of us today is that the silvical process applied by the beetles is often indicative of the best natural system of silviculture to be applied to these trees. What did the beetles do?

First of all, we must recognize that there are several different kinds of beetles at work in different parts of the ponderosa pine region, and they do not all follow the same rules. On examining the distribution of insect species in the ponderosa pine region, we find certain species following the range of the Pacific Coast form of *Pinus ponderosa* and different species associated with the Rocky Mountain form of *Pinus ponderosa scopulorum*. The differences are so marked as to indicate that, from the silvical standpoint, we are really dealing with two different trees. Baker and Korstian (*1*), Korstian (*2*), and Weidman (*3*) have shown consistent differences in climate, tree characteristics, and hereditary traits between the subregions of the ponderosa pine region, particularly between the *ponderosa* and *scopulorum* forms. The insects found in each of these subregions tend to confirm the validity of these different races or forms of ponderosa pine. Consequently, we cannot generalize about the silviculture of the ponderosa pine region, but must consider its component parts.

Throughout the range of the Pacific Coast form of *Pinus ponderosa* the mountain pine beetle (*Dendroctonus monticolae*, Hopk.), the western pine beetle (*Dendroctonus brevicomis* Lec.), and the California flatheaded borer (*Melanophila Californica*, VD.) are important silvical factors.

Mountain Pine Beetle

The mountain pine beetle plays an interesting and important silvical role in converting young, even-aged stands of ponderosa pine into uneven-aged forests. Sometimes it assists forest succession by completely changing a temporary type forest to a climax forest. For example, over large areas in the north plateau subregion young, fully stocked, even-aged stands of ponderosa pine may be found on what were once old burns. These even-aged stands do very well and produce high yields up to about 150 years of age. At this point they become overcrowded; the mountain pine beetle moves in and shoots them full of holes. The holes fill in with reproduction and from then on the forest develops as an uneven-aged stand of even-aged groups.

It is typical of the mountain pine beetle to wipe out temporary-type forests such as lodgepole or white pine, which have come up in old burns and thus aid the natural ecological succession to the climax type, but sometimes it also does this in ponderosa pine stands. For instance, within the borders of an old burn on the north slope of Sugar Hill in the Warner Mountains of northeastern California, a dense mixed stand of ponderosa pine and white fir came in. When this stand reached pole size, crowding commenced. The mountain pine beetle moved in, swept through this young stand—confining its epidemic to the borders of the old burn—and removed all the ponderosa pine, thus converting this stand into a pure white fir type for which the site was probably best suited.

Western Pine Beetle

In the interior ponderosa pine type of forest in the north plateau subregion, the western pine beetle appears to be the dominant silvical agent. Here its silvical function seems to be to thin overcrowded stands by taking out weak, crowded, slow-growing trees and those of declining vigor owing to drought, root troubles, or other causes. In its work, it applies what might be regarded as a "shelterwood system" of cutting. In overcrowded stands it makes "preparatory cuttings" by "thinning from below," taking out slow-growing, intermediate, codominant, and suppressed trees. Then it makes "re-

[1] Presented at a meeting of the Division of Silviculture, Society of American Foresters, in Seattle, Wash., October 12, 1949.

moval cuttings" by taking out whole groups of overmatured trees, leaving holes in the forest. These holes fill in with reproduction. As the advance reproduction begins to crowd the older trees, the overstory gives way and the process of removal continues with young trees replacing the old. This process tends to maintain an uneven-aged stand, because the olders trees are killed and replaced in a group-wise fashion.

For many years the western pine beetle was combated without conspicuous success by the direct control measures of felling and burning infested trees. Then, when the role this beetle was playing in the silvics of ponderosa pine was realized, the beetle was tackled silviculturally. High-risk, beetle-susceptible trees were thinned from the stand before the beetles attacked them. By "beating the beetles to it," we have had remarkable success in reducing beetle-caused losses by over 90 percent in the first years after cutting, and over 70 percent for periods of more than ten years after cutting. Many foresters are familiar with the experiment in beetle control through sanitation-salvage logging, which was first applied in 1937 at Blacks Mountain Experimental Forest in California. It since has been applied on several privately owned timber tracts and on many national forest and Indian reservation timber sales. The principle of selecting high-risk trees as the first elements to be removed from the stand under any system of marking has been generally accepted and applied through the north plateau subregion. Too often it is believed that the same system can be applied throughout the entire ponderosa pine region; but this belief is not valid, for we are dealing with other insects whose behavior is not the same as that of the western pine beetle.

In the California subregion, lying mostly west of the Sierra Nevada, the western pine beetle is also present; but its behavior is very different, or at least the aggressiveness of its attack is slowed to the point where it is no longer a dominant element. Normally, it is present in endemic numbers, killing a few weakened or injured trees every year. Then, after a drought, fire, or an outbreak of Ips beetles, a sudden epidemic may develop. Large groups of trees of all ages and degrees of vigor are killed, apparently indiscriminately. No method of selectively removing the weaker trees in the stand would appear to have much chance of stopping these epidemics. For this reason, sanitation-salvage logging for western pine beetle control never has been advocated by the entomologists working on this problem as applicable to west-side stands of the California subregion.

The silvics of the California subregion are complicated by several important tree species, a great variety of mixtures and types, and a number of different primary insects associated with each tree. The insects behave differently on every acre, depending upon the tree species, age classes, and stand densities involved. No wonder that Ducan Dunning has developed his "unit area control" system of applying silviculture to this perplexing assortment! That's what the insects do, too.

Black Hills Beetle

In the eastern Rocky Mountains and central plateau subregions, the Black Hills beetle (*Dendroctonus ponderosae* Hopk.) has been the most influential insect working on the *scopulorum* form of ponderosa pine.

In habits and character of attack it is very different from the western pine beetle. Normally, it is scarce and found breeding only in a few unthrifty trees. Its outbreaks are sporadic and exceedingly aggressive. When outbreaks occur, they usually start in localized centers and quickly spread and increase in intensity. Then all classes of trees are attacked with no preference shown for understory, slow-growing, or weakened trees. In fact, it seems to prefer the thriftier, fast-growing trees to the slow-growing ones. In general, fully stocked to dense stands of trees over 75 years of age seem to be preferred. Stands younger than this, trees grown in the open, and those around the margin of openings seem to be avoided.

It appears to make selection cuttings, taking out large groups of trees which have reached a certain age. The large openings left by its group-kills fill up with seedlings and a new even-aged group develops. The forests of this region are characteristically more even-aged by large groups than the Pacific Coast form, and this beetle may be largely responsible.

Studies have been conducted to correlate outbreak cycles with stand conditions, tree growth, and precipitation. So far, no really significant correlation has been found; nor is it possible to select high-risk, susceptible trees, for this beetle apparently does not base its attacks on tree selection and shows no predilection for unthrifty trees.

Other Insects

In the Southwest a different set of bark beetles is found working on ponderosa pine, but they do not seem to be as important in dominating the silvics of ponderosa pine in that region as they do elsewhere. The late G. A. Pearson was more impressed with the importance of lightning, mistletoe infection, twig cutting by squirrels, or stagnation as causes of mortality than of bark beetles, although admitting that in many instances bark beetles dealt the final blow which killed the trees (*4*). He also stated, "It is possible that variations in bark beetle activity may account in large degree for the erratic death rate." The fact that bark beetles are generally of less importance in the Southwest than in the Northwest may explain why some foresters and forest-entomologists were not able to see eye to eye with Pearson on many silvicultural problems of the ponderosa pine region. From a silvical standpoint, they were really not dealing with the same tree.

Other insects which have an influence on the silviculture of ponderosa pine "from cradle to grave" should be mentioned. The ponderosa pine reproduction weevil often exerts decisive pressure on plantations and on the natural restocking of burns. Some planta-

tions which have been attempted outside the tree's optium range have all but been wiped out by its attacks.

The engraver beetles, Ips, may become destructive when loggers make sporadic cuttings in the spring of the year and leave their slash unlopped and unscattered. The penalty may be the wholesale killing of second-growth stands. It is well to treat these Ips beetles with respect in cutting and thinning practices.

The defoliators, such as the pine white butterfly, the Pandora moth, and the pine variety of the spruce budworm, may flare up at any time and cause extensive damage. Six townships of ponderosa pine were leveled by the pine white butterfly on the Yakima Indian Reservation about 1893—an example of what this insect can do and may do again. So far, no one has been able to point out the silvical significance of pine defoliators. They are just as destructive as fire, and just as erratic. Until we know more about them, we will not try to control them with silvicultural practices, but will depend upon airplanes and DDT.

Where certain insects play a dominant role in ponderosa pine silvics, the answer to silvicultural problems can be found by studying the natural systems which the insects apply. To paraphrase Solomon's advice, "Go to the ant, thou sluggard; consider her ways, and be wise," my advice to the silviculturist is to study the insects and learn of their ways.

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Reproduction of Ponderosa Pine[1]

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REPRODUCTION is by no means a universal problem in ponderosa pine, but practically all western regions contain sizable areas where lack of regeneration presents a challenge to forest managers. The one outstanding exception is the Black Hills region of South Dakota where seedling crops come in regularly barring destructive fires or complete denudation (*5*).

Two rather distinct problems are involved, one characteristic of mixed stands and the other confined mainly to pure or almost pure stands. In pine mixtures, the overall restocking is usually good but seedlings of the more tolerant and less valuable associates—white fir, Douglas fir, and incense cedar—often outnumber and outgrow those of ponderosa pine. In many instances the continued existence of the pine in these mixed stands is seriously threatened under selection cutting.

This paper deals entirely with the problem of the pure pine stands which reproduce sparingly or at long or irregular intervals. Here the need is one of securing new seedlings frequently enough to maintain a well-stocked stand.

Many investigators have studied and reported on various phases of ponderosa pine regeneration but probably no one has studied the problem as intensively or for as long a period as the late G. A. Pearson. After almost forty years of work in northern Arizona, he concluded that five factors call for special consideration in analyzing the causes of poor restocking and in developing a plan of management that will provide an orderly supply of new recruits (*12*). These are: seed supply, rainfall, seedbed, cutting practice, and protection. Reports from other regions indicate that these same factors are important wherever ponderosa pine grows, although their relative weight varies from region to region.

Seed Supply

Since ponderosa pine seed rarely remains viable more than one year on the ground, germination in any one growing season hinges mainly upon the quantity of seed produced the previous fall. Cone crop production varies greatly from year to year but it follows a very irregular pattern, and the factors that determine the size of the crop are imperfectly understood.

In the Southwest, there is a complete failure about one year out of every four, a good crop about one year out of every three or four, and usually a bumper crop about one year out of six or seven. When allowance is made for damage by cone beetles and losses from seed-eating rodents, the light cone crops of intervening years are largely ineffective since there is seldom a surplus for regeneration. A similar irregular pattern of cone crop production has been reported for California (*15*) and for the Northwest (*17*).

Early interest in seed production centered on the determination of the minimum number of seed trees that should be reserved from cutting to provide a satisfactory stand of seedlings. Their number was placed at four large trees per acre in the Southwest (*7*), three in California (*15*), and two in the Northwest (*17*). In the light of more recent experience, these estimates appear to be optimistic. Under the much lighter cuttings that now pre-

[1]Presented at a meeting of the Division of Silviculture, Society of American Foresters, Seattle, Wash., October 12, 1949.

vail in virgin ponderosa pine, however, the matter of seed trees is of less immediate concern. Many trees of seed-bearing size are almost always retained. Where second cuttings are in progress, seed supply may still call for special consideration. This is especially true if the first cutting was heavy and stand openings have failed to restock in the period between cuts.

Rainfall

That climate, mainly rainfall, holds one of the principal keys to the reproduction problem is indicated by the very location of the pure pine stands that most frequently fail to restock. In most cases, the lower, drier sites, where summer rains are deficient or poorly distributed, give the most trouble.

At first glance, the average rainfall pattern in the Southwest would appear to favor reproduction since July and August, in the middle of the growing season, are the highest rainfall months of the year. Nevertheless, the rainy season is usually preceded and followed by a severe drought of 6 to 9 weeks' duration. And in only a few years is rainfall adequate in amount and distribution for the survival of newly germinated seedlings. If summer rains are late in starting, seedlings may germinate readily but are too tender to withstand the first killing frosts in the fall. If rains start early but are interrupted by a hot, dry spell of two to three weeks' duration, drought losses are exceedingly high. In the Southwest, seedlings are very susceptible to drought through both the first and second growing seasons and two consecutive years of favorable moisture are required on many sites to insure the establishment of a seedling crop (*7*). At the Fort Valley Experimental Forest in northern Arizona, two consecutive years of favorable rainfall have occurred only 8 times in 44 years of record.

In California and the Northwest, the rainfall pattern is very different, with a higher winter precipitation and a prolonged drought in July and August. Here again, it is doubtless true that in those areas where reproduction is critical, widespread germination and survival are possible only in years when soil moisture is sustained by better-than-average precipitation.

Most foresters recognize that neither ample seed nor abundant rains, alone, can guarantee a good catch of ponderosa pine seedlings. A coordination of the two is obviously required and it is here that chance plays a leading role. At the Fort Valley Experimental Forest seed crops and rainfall have combined to produce a fair crop of seedlings in only four years since 1908, and in only one year, 1919, did seedlings survive in number over wide areas. If good seed crops were produced annually, or if rains favorable for seedling survival could be expected every summer, reproduction would be a relatively minor problem.

Seedbed

Foresters are apparently not in complete agreement as to the conditions that characterize an ideal seedbed for ponderosa pine. In the Southwest, Pearson (*7, 8, 11*) has emphasized the advantages of a light, porous soil over a compact clay soil and the importance of controlling competing bunchgrass vegetation, where it forms a dense cover. He also concluded that although a light cover of litter and slash is usually beneficial, especially on compact soils that have been denuded, heavy litter, heavy slash, or heavy shade are in most cases detrimental (*9, 10, 13*). Baker, referring to low elevations in the Sierra Nevada in California (*3*) has stressed the need for control or removal of competing chaparral and the merits of "recently disturbed mineral soil free from root competition." His laboratory studies have further demonstrated that light, porous soils usually favor early development (*1*) and that newly germinated pine seedlings, while subject to loss from very high surface soil temperatures, are less susceptible to heat injury than Douglas-fir or western redcedar (*2*).

Dunning (*4*), working with mixed pine stands in the higher Sierra, has also pointed out the importance of brush control in favoring reproduction. On the poor sites, however, he believed some cover was necessary to reduce frost damage and prevent excessive evaporation. Ceanothus squawcarpet (*Ceanothus prostratus*) was pointed to as one form of ground cover that favors seedling establishment.

Observations in central Oregon led Sproat (*16*) to the conculsion that ponderosa pine seedlings require some protection from overstory trees; that large numbers of seedlings and saplings are killed from exposure when the overhead canopy is abruptly removed; and that soil disturbance is not always an aid to seedling establishment. He also noted that survival was good where ceanothus squawcarpet formed a protective cover. Munger and Westveld (*6*) found that on the porous pumice soils of central Oregon, the presence of unburned slash favored both germination and survival.

Many additional viewpoints on the influence of shade, litter, slash, or competing vegetation could be cited, but they would probably not help to clarify the situation for the entire ponderosa pine region. Most foresters will agree, however, that in pure pine stands, soil moisture is more often limiting than light, and that the best seedbed is ordinarily one that will maintain a supply of moisture in the surface soil during critical drought periods. Thus, while dense grass or chaparral is generally deterimental because it seriously competes with newly germinated pine seedlings for soil moisture, a few species such as ceanothus squawcarpet apparently favor reproduction. Likewise, while shade is usually not regarded as essential to ponderosa pine regeneration, there are conditions under which light shade, such as that furnished by slash, may be beneficial by helping to conserve moisture. This is evidently true of the heavy compact soils of northern Arizona and the highly porous pumice soils of central Oregon. On heavy soils the presence of a light

cover of litter or slash may also help to reduce losses from frost heaving. There is probably no one set of seedbed conditions that can be expected to provide satisfactory restocking in all ponderosa pine regions or under all combinations of soil and ground vegetation.

Cutting Practice

There was for many years a conviction among foresters that if an ideal method of cutting could be found, ponderosa pine seedlings would appear in abundance following cutting, and the reproduction problem would be solved once and for all. Experience in the Southwest has indicated that method of cutting, while important, exerts a much less direct influence on regeneration than rainfall, seed supply, and seedbed condition. In 1919, the one year of widespread reproduction in northern Arizona, a good catch of seedlings was obtained under almost all degrees of cutting and in understocked virgin stands as well. The spots that failed were mainly the old clear-cuttings that lacked seed trees and the areas where light or nonuse by grazing had fostered the development of a dense herbaceous vegetation.

In general, light cutting increased both the volume of seed and the numbers of seeds germinating; heavy cutting, in contrast, favored survival and growth by making more space available for the development of a new generation. In almost all cases the combination of a bumper cone crop, abundant rain, and a generally exposed mineral seedbed far outweighed the influence of the proportion of the stand cut or retained. In years that are only moderately favorable for reproduction, the influence of method of cutting could be expected to bear more weight. In the Southwest, additional experimental evidence is needed on this phase of the reproduction problem.

Protection

From the time ponderosa pine seed nears maturity in the cone until the young tree grows into small pole size, it is subject to loss or damage from a wide variety of agents. Poor stocking in many localities can be attributed to fire, logging, insects, rodents, livestock or game animals, or to a combination of one or more of these factors.

The importance of protecting advance reproduction from loss or damage during the logging operation has been stressed in all ponderosa pine regions. This is of particular importance where advance growth is sparse or scattered. In dense reproduction a certain amount of damage can ordinarily be permitted, and felling, skidding, and slash disposal, if carefully supervised, can even be used as one means of opening up or thinning dense groups.

In the seedling and small sapling stage, ponderosa pine is highly susceptible to fire kill, and light ground fires are no exception. Frequent fires, before the day of organized protection, no doubt account in large measure for the lack of reproduction, gaps in broad age classes, and the generally understocked condition of many virgin ponderosa pine stands. The protection of reproduction is, of course, only one of many reasons why uncontrolled fire must be held to a minimum in a managed ponderosa pine forest.

Among the biological factors that have caused concern in the Southwest and other regions are the cone beetles, squirrels, chipmunks and other seed-eating rodents, rabbits, porcupines, and tip moths, which may cause serious stem injury, and livestock and deer, which frequently browse young pines. Though less spectacular than fire or logging, these biological factors may prove even more serious in the long run because they continue year after year and seldom receive the benefit of corrective measures. Without going into the details of type and extent of loss from any one factor, it may be stated that practical control measures have been worked out for some agents, but remain to be developed for others. The types and extent of damage vary greatly, not only from one locality to another but also from one year to the next. The matter of providing adequate protection will accordingly need to be worked out on a strictly local basis. The objective should in most cases not be an attempt to eliminate completely a certain type of damage but rather to reduce it to an acceptable minimum.

Application in Southwest

It would be gratifying if one could weigh the evidence that has been collected from scattered areas and present a simple, practical formula for securing ponderosa pine reproduction that could be applied with equal success in all parts of its far-flung range. The knowledge accumulated to date scarcely justifies such an attempt. Instead, a plan of management that shows promise for the Southwest will be considered.

Thanks to a few good reproduction years such as 1919 in northern Arizona, the majority of ponderosa pine stands in the Southwest now contain a fairly good representation of saplings and small poles. These assure forest managers that cutting can proceed into the immediate future without running the forest enterprise into bankruptcy. They do not by any means solve the reproduction problem, however. Stands are being continually opened up through cutting and mortality, and in many cases the new openings fail to restock as promptly as good forest management requires. Dependence cannot be placed on another year like 1919 because there is no assurance that such a highly favorable combination of circumstances will occur even once during a rotation. Because seed year and rainfall play such a decisive role, there is a growing realization that silviculture, no matter how exact, cannot guarantee a crop of seedlings in any one locality and year. It can, however, take advantage of the moderately favorable seasons that can be expected once in five or ten years by giving more attention to those factors that *are* subject to some control: number of seed trees, seedbed condition, and protection.

The light, frequent harvest cuttings now widely used in the Southwest provide the main framework

of the general plan. Here the objective is to convert gradually to a selection forest in which all size classes will be adequately represented. Under this scheme, an ample number of well-distributed seed trees should always be available. In localities where heavy rodent populations nullify this provision, supplemental control measures may be necessary to insure an adequate seed supply.

If cutting is carried out skillfully, the openings created during any one harvest cut will be small in size and in most cases the herbaceous vegetation will not have a chance to develop a dense cover that will seriously interfere with pine regeneration. Additional measures, including the use of grazing as a silvicultural tool to reduce grass competition and the possible use of mechanical soil scarification where compact soils or heavy litter hinder regeneration, may be in order. Adequate protection from damaging agents must of course be provided wherever management is directed toward the production of full timber crops.

Under this general plan, it should be possible to maintain at all times an adequate seed source and a favorable seedbed in those openings that are in need of restocking. Reliance will be placed on the gradual restocking of small openings rather than upon widespread reproduction in any one year. Dense reproduction will usually not be required under light selection cutting because the side shade present within small openings or partially cut tree groups is often sufficient to induce good form as the trees develop.

The conversion of present irregular stands to the desired condition will call for long range planning and careful consideration of the key factors on each management unit. Old cuttings that are now seriously understocked present a real challenge to southwestern foresters.

Some 30 years ago, Walter J. Perry (*14*) published in the JOURNAL OF FORESTRY a concise formula for securing ponderosa pine reproduction in northern New Mexico. He advised in a terse 10-word message: "Chase the sheep; graze cattle; leave seed trees; burn slash." Looking at the reproduction situation in the Southwest in 1949, this directive could be changed to read: "Cut lightly; graze judiciously; protect vigilantly; pray for rain continually."

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When is a Management Cruise Necessary?

H. H. Chapman

"THE TIME table is the crucial factor in all practical policies." Field Marshal Jan C. Smuts, *New York Times*, February 29, 1948.

E. T. Hawes in his article "Is a Management Cruise Really Necessary?"[1] may have conveyed in this title the impression that inventories may be dispensed with in forest management. His paper does not bear out this assumption. Instead, it is a plea for proper timing of forestry measures with especial reference to the initial efforts to establish the practice of forestry by transition from former exploitation. Mr. Hawes has had fifteen years of experience largely in state and private cooperation in the southern region and has learned at first hand a lesson which the writer has been emphasizing for the past thirty years in both theory and practice; namely, that a detailed inventory—a forest survey—is not the first or the most important step to undertake with owners who are initiating forestry practice. It is this idea that Mr. Hawes attempted to establish.

As to the writer's experience in the South, which is the region represented in the discussion, there are two outstanding cases to illustrate the principle of timing emphasized by Smuts. The Urania (La.) Lumber Company, Henry Hardtner, president, was never furnished with a complete forest survey by the writer or the students at the Yale Camp during the period 1917 to 1942 while spring field work was conducted there, or by the company forester. It was not until 1949, that a complete inventory was made by a firm of consulting foresters. Mr. Hardtner had his own estimates of standing timber and deemed them sufficient. No formal management plan was ever made for the property. Yet the operation is on a sustained cut today and will continue indefinitely. This accomplishment is due primarily to the fact that the company can draw from a territory about twice as large as its own holdings, by successfully competing for stumpage on the market.

Since 1913 management plans at Urania have been concentrated on efforts to reproduce and grow better crops of pine timber. Nothing was said by W. W. Ashe, W. R. Mattoon, or H. H. Chapman about a forest survey. Fire protection was stressed, and a continuous effort was made by Mr. Hardtner in cooperation with the Southern Forest Experiment Station and the Yale School of Forestry to learn how to reproduce both longleaf and loblolly pine in fully stocked stands, and later how to thin the stands thus obtained. The lessons learned revolutionized the practice of silviculture for longleaf pine and may yet bring about a similar improvement in methods of reproducing and growing loblolly pine instead of worthless hardwoods.

If foresters had failed to solve these two problems, any costs devoted to detailed forest surveys would have been thrown away. Through their success alone, the company's faith in forestry and its permanent future have been assured.

In 1922 the writer was asked to examine and report on a policy of management for the Crosset Lumber Company's lands at Crossett, Arkansas. This preliminary examination was made by auto traverses of roads in ten days, cost the company $300, and was adequate for the purpose of indicating future policy. The measures proposed were (1) immediate installation of adequate fire protection; and (2) the marking and leaving of two mature seed trees per acre in future cuttings.

A rough estimate of future growth per acre was given, based on two representative sample plots on selectively cut areas. A forester was employed. After this work was well under way, a preliminary strip forest survey was run in 1923 to get a more accurate figure on future growth per acre. As a side project, a few permanent sample plots were established to determine growth. These plots have proved very instructive 20 to 25 years later.

Not until 1939, or 16 years after the initial survey, was a complete inventory taken, with a detailed study of growth, for prediction of future yield. The company had meanwhile been cutting largely on the remainder of the old growth timber. When the shift to second growth finally occurred, and not before, did it incur the moderate cost of this inventory. The work was repeated in 1948-1949. By this time the recurring inventory has become indispensable as the basis of present operations and for determining the size of the manufacturing plants dependent on the productive capacity of the forest.

The point to be emphasized is that the spark which touched off this entire train of action was not a forest inventory, actual or proposed. It was a prophesy that if the company continued to cut clean and burn slash it would lose $4,165,000 from growth destroyed, within the future thirty years. (This was a considerable underestimate, but it convinced the officials.)

What Hawes said in his article follows the above procedure, namely, to put first things first, and attack the core of the problem at once. Inventories never solved the problem of longleaf pine reproduction and controlled burning. Inventories reveal the widely lamented invasion of inferior hardwoods in pine areas in the loblolly belt, but they do not point to the cure for this situation. Initial inventories do not indicate the proper methods of thinning young stands or the increased growth to be expected from these practices. Inventories belong in the category of records, not of dynamic operations and, of such, Hawes correctly emphasized the necessity of strictly controlling their cost, which is recoverable only from operation and from improved management. Records and inventories are indispensable in the conduct of a business, but excessive costs and detail are as bad as insufficient data. If there were any merit in figures for their

[1] Hawes, E. T. Is a management cruise really necessary? Jour. Forestry 46:895-896, 1948.

own sake, we might all be engaged in constant detailed inventory records, without worrying about how to grow or protect timber, find markets, or indulge in other dynamic activities.

In 1931 the writer published a textbook entitled *Forest Management* (Williams Press, Inc. Albany, N. Y.). Under Part II, chapter X, Evolution of Forest Organization, he outlined five stages of the development of a business enterprise. The preliminary stage I *precedes* the initiation of the project (forestry practice by a lumber company, for instance) and consists of the preliminary examination and report. Here is where airplane maps and their interpretation as mentioned by Hawes can play their part.

The initial stage II begins with favorable decision on the project and with action committing the owner to undertake *organization and control*. The organization is temporary and crude and the administrative measures are confined to fire control and first attempts at silviculture. But immediate steps are also taken to determine what further measures are necessary for development of the enterprise, the most important of which *at this time* is the detailed forest inventory. This is the fact-finding activity (research) which in stage II prepares the way for better management sought in stage III.

In stage III, that of *development* and organization, the fruits of stage II factfinding investigations appear in efforts to make the property more accessible, protect it and utilize its resources. In this stage, research (factfinding) is directed to the task of intensified silviculture and utilization, in preparation for stage IV to follow.

Stage IV is that of *regulation* and organized production, on a property fully developed to a high stage of efficiency.

Stage V is that of continuous and *increasing* production.

The whole point of Mr. Hawes' article is to reëmphasize the importance of the preliminary examination and initial recommendations, for owners contemplating the practice of forestry. As I tried to make clear in this text on forest management, projects are of two classes, dynamic or operative, and factfinding. All factfinding projects are merely preliminary steps which must lead to recommendations for dynamic measures. Hence a preliminary examination which recommends only the initiation of a factfinding inventory, and which makes the worse mistake of specifying a thorough and expensive one at that, has left out the far more immediate and necessary requirement, the recommendations for immediate action on the ground, whatever it may be.

Only when and if the owner is convinced that there are measures he must take in management now will he be placed in the normal channel of evolution of a full fledged forestry enterprise such as exists at Urania, La. and Crossett, Ark. Factfinding projects must at the same time be undertaken since they are required for guidance of the *next* steps in management, and the dual effort continues. But only through dynamic projects will the owner obtain either the cash or the prospects which will induce him to part with the cost of the further factfinding, which costs remain unproductive and a drain on profits until translated into action and results.

Jan Christian Smuts knew what he was talking about when he emphasized the preeminent importance of timing in practical affairs. Arguments as to the relative importance or nonimportance of forest surveys are meaningless until they are considered with reference to the owner involved, and the specific stage of his enterprise. In Stage I, Hawes' program of action is the only sound recommendation.

For companies already committed to forestry (and what a different category from the former class) the forest inventory of stage II has primary importance as a factfinding project only, but the practical measures of fire protection, initial silviculture, markets, and transportation continue to occupy the center of the stage, as do dynamic operations at all stages. When this time perspective is attained, argument must disappear in the face of obvious facts and historical examples drawn from every operation which has ever made the transition to forestry.

What Economic Studies and Surveys Are Needed for Development of a Sound National Program of Insect and Disease Control?[1]

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TO CATALOG the economic studies and surveys needed to develop a sound program for the control of numerous kinds of insects and diseases known to be destructive to the forests of the nation would be a Herculean task. Anyone who attempts to make such a catalog should have a firm conviction of his interpretation of the meaning assigned to the words "economic" and "sound." The forests of the nation differ widely in type and kind, the present and future value of each unit depends largely on the use it serves, the ownership is divided between agencies and individuals, and various areas are managed or controlled for many different purposes. It would be difficult, if possible, to get general agreement on how the words "economic" and "sound" should be interpreted in their application to such a program.

I know no way to harmonize all the various interests and objectives that are involved, nor do I believe it is desirable or necessary that any rigid set of factors be universally applied in determining what is economic or what is sound. Tree killing may have a very different value in one area from what it has in another even though the kind of tree and species of pest are the same in both localities. It may be highly desirable and economically sound to spend large sums for surveys and measures to suppress, eradicate, control, or prevent the spread of an introduced pest even though it has caused comparatively little damage and done little more than demonstrate its potential importance. However, to do this and ignore native pests which may destroy that which is being protected from the invader is neither economical nor sound.

[1] Presented at a joint meeting of the Divisions of Forest Economics and Private Forestry, Society of American Foresters, in Seattle, Wash., October 12, 1949.

Problems of Foreign Pests

Three introduced pests — the gypsy moth, white pine blister rust, and chestnut blight—have well demonstrated their importance and the destruction they can cause to our forests.

For chestnut blight, studies and surveys would be of little value in developing a program for disease control.

For the gypsy moth, additional economic studies are not required to guide the control program which should be followed. Intensive surveys are needed, however, to plan how such a program should be carried forward.

For blister rust, an important disease which has to be controlled in areas where white pines are grown for present and future use, economic studies and surveys are needed. A study of the relation this disease has to the future of one area, the Inland Empire, has been completed and a similar study is under way in the sugar pine region. Economic studies and surveys to analyze, appraise, and develop a firmer basis for control programs should be carried on in other areas where white pines are grown.

A sound national program of insect and disease control must try to prevent the introduction of destructive forest pests. The effectiveness of this essential part of the general program will depend on the extent of our knowledge of the forest insects and diseases that occur in other countries. What is now known is far from adequate. Surveys and studies in other countries to determine distribution, relation to hosts, environment, importance, and other factors are needed to provide a basis for administering this part of a national program of forest pest control.

Information on the hosts and the development of forest diseases in other countries is perhaps of greater importance than is information on the occurrence and hosts of insects. Many diseases are difficult to detect by inspection. Of greater significance, however, diseases frequently, as is the case in blister rust, depend on alternate hosts for their development. It is, therefore, necessary to safeguard or prohibit the introduction of trees and other plant hosts if we are to have an effective program to protect our forests.

Problems of Native Pests

A national program of insect and disease control requires more than economic studies and surveys. Knowledge of the pests, how they behave and react under different environments, and how they affect different hosts are essentials. How they can be controlled, the degree of effectiveness attained by different control measures, how long it may be after the application of control before the pest will again appear in destructive numbers are also highly important. Information of this nature is developed through research. There is a close and intimate relation between surveys, control, and research. In fact, surveys and control are in reality the application of information gained through research, and there is no clear distinction between any segment.

If research were static, there might be a way to outline a reasonably firm, continuing basis for economic studies and surveys. Research is steadily developing new facts, and the picture of pest control is continually changing. Recently developed information has brought new concepts for insect surveys and control. Not many years ago control of barkbeetles depended on the use of large numbers of men to fell and peel infested trees before the beetles emerged, entered, and killed additional trees. Today better control can be obtained by fewer men at appreciably lower costs.

Methods for classifying areas into zones of hazard and procedures for selective logging are recent research developments. The

value of these new techniques and their applicability to the control of the western pine beetle have been demonstrated.

Within the past three years it has been determined that widespread infestations of defoliating insects, such as the tussock moth and spruce budworm, can be effectively controlled. This is an achievement little dreamed of a few years back.

These examples show how new knowledge is rapidly changing the concepts of forest insect control. The influence this information has on the economic studies and surveys needed to develop a national program of insect control is not generally understood. What improvements will be made in the future is hard to foretell. It is certain, however, that any general program for studies and surveys that may be devised today will require revision, and perhaps the revision will be necessary before the program could be effectuated. It is important that this possibility be recognized.

The continuing modifications in criteria used to appraise the value of various kinds of trees, and the increasing appreciation of the value of trees and forests for purposes other than lumber and timber products, are other factors of significance to any study for an economically sound control program. The development of new techniques in harvesting and utilizing forest products also changes the value that can be assigned to them. The continuing expansion of highways and the building of access roads are factors of prime importance and are perhaps the key to a sound pest control program for many sections.

With all the many related factors that must be considered we must not assume that a program developed on the values of today will be sound for the future. In developing a national program of insect and disease control we must recognize the need of flexibility and continuous review. Each situation must be appraised on the basis of facts that are available.

This conclusion does not mean that a general pattern for forest pest control should not be developed. The need for one has been fully demonstrated. Because forests are essential to the economic development and stability of our national economy, to permit them to be destroyed by insects and diseases when practical ways to prevent destruction are known is folly.

Forest Pest Control Act

The Forest Pest Control Act of 1947 provides a charter for carrying out measures necessary to accomplish the objective of a sound national program of forest insect and disease control. It does not prescribe details but establishes a broad policy and the principles that should be used to carry it out.

Its fundamentals are the protection of forests owned or controlled by the federal government; cooperation with governments of states, territories, and possessions and with private timber owners to protect forests on their lands; leadership in making surveys to detect and appraise infestations of forest insect pests and tree diseases; determination of measures which should be used for control; and provision for planning, organizing, directing, and carrying out necessary control projects.

The policy and procedures established by the act do not mean or even infer that the federal government proposes to take over the control of forest pests on state and privately owned lands, or that it should be expected to participate in control programs where the problem is of local significance only. Cooperation and aid are authorized and may be extended in those cases where infestations are of an emergency character either because of size, extent, potential significance, or of such a nature that control is necessary to protect and preserve the forest resources of the nation.

The act requires that when control work is done on state and privately owned lands, contributions toward the work must be made by persons, associations, corporations, states, territories, possessions, or subdivisions thereof in form and manner acceptable to the Secretary of Agriculture.

Contributions

Of significant importance is the fact that no formula is prescribed for determining the amount or nature of required contributions. Fixed requirements for the amount and character of contributions are not in the interest of sound pest control. A dangerous new pest may be discovered which should be promptly controlled. Incipient outbreaks which threaten extensive forest areas may be detected in a locality where the possible damage is of little or no significance to the individual state or landowner. In such cases contribution to the control work may be nominal. In other cases, the significance of an infestation to a locality or area may be much greater than it is to the nation at large. Here the contribution from the locality to the control project may well be greater than that made by the federal government.

Even though it is undesirable to have a fixed formula for determining the amount and character of contributions that should be made to each cooperative control project, it is desirable to establish a general pattern that can be used as a guide for planning control programs. In considering such a pattern we must not overlook the fact that detection and appraisal surveys are an essential feature of forest pest control. The Forest Pest Control Act does not require contributions for survey work done on state and privately owned lands. Contributions and close cooperation in detection and appraisal surveys, however, are highly desirable and add to efficiency and thoroughness. Without local interest and aid it is frequently impossible to do all that may be needed. State and local participation in surveys may therefore be given consideration in interpreting the amount of contributions that may be required from cooperating agencies as a basis for conducting a specific control project.

The ratio between federal and state and local contributions to cooperative pest control projects is usually based on approximately equal division between the federal government and the state

and the local agencies and individuals participating in it. From the federal point of view the method used by the state and the participating local agencies and individuals to provide their share of the costs should be determined at the state and local level. This general 50-50 ratio has been considered reasonable and sound, and may be accepted as the general goal for cooperative control programs. Deviations from this approximate amount should be fully explained, understood, and accepted for individual projects.

Economic Studies

Reference to the Forest Pest Control Act and comments on its provisions have been inserted into this discussion because of the bearing this basic legislation has to the topics under consideration. Economic studies and surveys are of little value unless something is done with the information assembled. The broad policy and authority set forth in the act should give assurance that needed action can be taken.

Economic studies to determine the practices to follow in any forested area are highly desirable. An economic study of the Blue Mountain area of Oregon would be especially helpful at this time when it is necessary to appraise the effect and importance of the current, widespread infestation of spruce budworm and to determine the soundness of a control program for all, or part, of the area where the outbreak occurs. No comprehensive study has been made. To wait until one can be conducted would result in much of the present forest being killed. Should this happen, the character of any study that may be made might be very different.

Useful and important as economic studies are, it seems obvious that control operations should not be delayed until they are completed. Economic studies of forested areas should, however, be carried forward as rapidly as practical. The facts they develop will aid in determining what control of insects and diseases is necessary to protect and preserve our forest resources.

Lack of data assembled through well planned economic studies does not mean that economic consideration should be ignored in developing a control program. No control project should be undertaken unless it has an economic justification. In appraising each infestation, one must carefully analyze the benefits that may accrue from control. Each analysis should aim to determine whether the expenditure is justified to protect and preserve the forest from the viewpoint of national and regional welfare (1) by enhancing its growth and maintenance to create forest wealth, (2) by promoting the stability of forest-using industries and employment associated therewith, (3) by aiding in fire control through reduction of the menace created by dying and dead trees, (4) by conserving forest cover on watersheds, and (5) by protecting recreational, wildlife, and other values of the forest. The analyses should also consider the potential significance of the infestation.

The word "potential" was included in the Forest Pest Control Act to assure that consideration would be given to the biological soundness of control programs. It is known that all infestations of insects and diseases do not have equal potential importance. Some may be on the decline; others may never cause important losses because of the presence of natural enemies or because of the action of other natural factors, including weather. Interpretation of what is meant by the word "potential" and appraisal of the significance of an infestation are matters which require the knowledge and experience of trained entomologists, or pathologists if the pest is a tree disease.

Detection Surveys

Basic to any sound program of forest insect and disease control is information on the status and occurrence of destructive pests. This information can be obtained only through detection surveys.

The methods to be used in conducting such surveys, and the thoroughness of the coverage required, vary with the pests, and differ with the region in which they are carried out. It is not practicable, even if it were desirable, to examine all forested areas with equal thoroughness. The most valuable forested areas, and those of a type where the hazard from infestation is high, should be given first consideration. A sampling procedure must be used. In planning surveys, we must first get data on the occurrence and abundance of pests of known economic importance and on those for which satisfactory methods for control are available.

These underlying principles are used in establishing and organizing the detection and appraisal survey which is being expanded with federal funds that became available July 1, 1949. It is the same policy that has been followed in earlier survey work. Likewise, the past policy of encouraging all forest observers to make, record, and supply data on presence of forest insect pests and tree diseases is considered an important continuing feature of the survey activities.

In short, in planning for detection surveys we propose to build on what has been done, to expand it, to extend it to provide coverage of the important forest areas, and to strengthen it by using new survey and techniques as their values are proven. Aircraft and aerial photography are the phases now receiving most attention.

Accordingly, the country has been divided into eight districts. The survey and appraisal work in each district is under the leadership of a technician who has had wide experience in this field. He has a limited number—varying with districts—of full time assistants. During portions of the year favorable for inspection, technicians are employed on a seasonal basis.

Effort is being made to secure the cooperation and active participation of all who can contribute. It is hoped to make the survey program a truly cooperative one and provide a place where all observations can be assembled, stud-

ied, and appraised under the leadership of individuals familiar with the problem and sympathetic to sound objectives of forest pest control.

The answer to the question, "What surveys are needed to develop a sound national program of insect and disease control?" can best be made by stating, "We should do more of what we are now, and have been, doing, over a wider area, and at the time most favorable for detecting the presence and measuring the abundance of known destructive pests for which control measures are available."

This is not all we should do. We should add surveys of the type which will aid in detecting new pests, and those which will develop data on insects and tree diseases that are generally prevalent to aid in determining their status and distribution. Facts on the occurence and significance of all forest pests are needed to aid in selecting those which should first be intensively studied to determine their habits and develop methods for their control. Such information is needed to carry out fundamental objectives—to protect and preserve the forest resources of the nation.

The Influences of Forest Lands Upon the Water Resources in the Missouri Basin[1]

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Some people believe that the problems of harnessing and utilizing the waters which flow down the Missouri River and its tributaries are solved with the construction of a series of large dams, supplemented by other engineering works. Unquestionably these structures play an important role in the solution but so do the conditions of the lands on which the rain and snow fall. The heaviest precipitation in the Missouri River Basin occurs in the regions where most of the forest lands are located: in the Rocky Mountains along the western rim and in the Ozark highlands of the State of Missouri. In this presentation are pointed out the contributions from the forest lands to the availability and usability of water, the measures which should be taken to increase the beneficial contributions, and a justification for such a program.

THE MISSOURI RIVER BASIN constitutes about one-sixth of the total land area in the United States. It covers all or portions of ten states —Montana, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa and Missouri. The forest lands which total approximately 45 million acres are principally located around the rim of the basin with the heaviest concentration in the Rocky Mountains, and in the Ozark highlands in the State of Missouri. The ownership of the forest lands can be roughly broken into three classes: federal, 21.5 million acres; state, county and municipal, .5 million acres; private, 23 million acres. Nearly all the federal ownership is in the Rocky Mountains, predominantly in national forests.

The term "forest lands" as used here, is not restricted to lands which are timbered. It also includes the intermingled and adjoining forest range lands, the areas at higher elevation above the timberline and the small wooded areas scattered throughout the farm lands in the Great Plains. It also includes lands not supporting trees at present but which are better adapted to the growing of trees than for other uses.

Effectiveness of Forest Lands for Watershed Purposes

Forested watershed lands in good, healthy condition are excellent natural storage reservoirs. Good forest cover—trees, shrubs, grass and litter—provides protection and stability to the soil. It also protects the soil from deep freezing and promotes a porous condition which enables the soil readily to absorb and detain the water that comes from rains or melting snow. Thus, good forests hold down the amount of surface run-off and reduce the height and frequency of destructive flows. Water that moves through the forest soil either returns to the surface weeks or months later in natural springs or stream channels, or collects in the strata underground where it may be made available by pumping. The clear sustained flows characteristic of well-forested watersheds are the direct result of the balanced natural relation between the forest vegetation and the soil.

In contrast, when the ground is bare of forest cover or the forest mulch is destroyed, as by fire, the soil loses its porous structure and much of its absorptive capacity. Similar unfavorable soil conditions develop on overgrazed forest ranges when the protective ground cover is too closely clipped and the surface is compacted by trampling of livestock. When the surface soil is thus altered and exposed, run-off is increased and accelerated. Organic material is oxidized and the top soil containing the rich spongy humus is picked up and carried away. Then heavy rains compact

[1]Address delivered at the 22nd Annual Convention, Association of Western State Engineers, Bismarck, N. D. August 22-25, 1949.

the soil and seal the surface against infiltration. Such exposed soil will freeze solid whereas much forest soil remains porous through the winter. Loss of vegetation thus cuts down the percolation of snow-water. All this means impoverishment of the land and impairment of the quality and usability of the water. Under such conditions, fluctuations in streamflow are magnified; the streams tend to rise swiftly to flood stages with each rain, only to drop later to very low yields or even to disappear temporarily. And because less water gets into the soil, less water reaches the underground basins to replenish them.

Furthermore, the absence of cover invites erosion. Once the eroding process has started, it tends to be cumulative. The loss of the porous surface soil exposes the denser and usually much more erosive subsoil. Damages from erosion to exposed soils may in only a few years become so extensive and so serious that the adverse effects will be felt for decades.

Good watershed management rarely precludes other forest uses. By careful planning and with some limitations, all the goods and services the forest can render may be obtained from watershed lands. Thus in most areas, the forest may yield timber products, provide forage for livestock and game, afford opportunities for recreation, and in other ways produce returns without serious detriment to the watershed. However, under some circumstances where damageable values downstream are high, soils unstable, and run-off problems serious, watershed protection may make it necessary to forego one or all of the human uses to which forests normally may be put.

The Present Situation

The national forests in the Rocky Mountains play the major role in the basin's western water supply. More precipitation, much of it in the form of heavy winter snow, is received in the high mountain forests than in the western three-fourths of the basin as a whole. At the higher elevations, snow melt extends into the late spring and early summer, thus making the water available when downstream requirements are high. For example, about forty percent of the run-off from the national forests of Colorado and Wyoming takes place in June and July.

The average annual flow of water from the 16 million acres within the national forests of this part of the basin is estimated at 12 million acre feet. From some 230 million acres of other lands west of the Central Prairies, the part of the basin in which there is a place for irrigation, the run-off is estimated at only 19 million acre feet. Thus, while the national forests embrace less than seven percent of the irrigation watershed, they yield almost forty percent of all the water potentially available for irrigation.

Estimates are not available as to the degree to which the water from these national forests is utilized. Numerous impoundments have been constructed for irrigation and power within the forested area, many of which are within the national forests. Much of the water impounded further downstream for irrigation and as an aid to navigation also comes from the forests. Some forty-five cities, towns and rural communities with a total population in 1940 of 590,000 people, are dependent upon the national forests for their domestic water supply. In addition, an unknown but sizeable volume of mountain water reaches the underground basins from which it is pumped for irrigation and domestic use. In the final analysis, and considering navigation, all the water from the national forests is used at least once and much of it over and over again.

Forest fires are a continuing source of damage to the forest land resources. Over the past 15 years, an average of nearly three-quarters of a million acres, mostly in the Ozarks, has been burned over annually. In the national forests where a high degree of fire protection has been maintained, the average area burned over annually has been brought down close to one-tenth of one percent of the total area protected, though for some tributary watershed, the area burned may be considerably higher. In contrast the average annual burned-over area on state and private forest lands in the State of Missouri is about six percent.

Fire not only destroys timber but also recreational opportunities, fish and wildlife and feed for livestock. Moreover, the soil-protecting litter of twigs and leaves on the forest floor and the organic material in the soil itself are lost.

In parts of the Rocky Mountain area, land use practices have accelerated damages from soil erosion and floods. On the slopes subject to violent thunderstorms, some soils are highly erodible and easily subject to damage if unprotected by vegetative cover. Here, fire, livestock and big game grazing, mining operations, logging, and road building have contributed to extensive sheet and gully erosion, to instability of stream channels, and heavy silt movement. Erosion generally has not been so widespread at the higher elevations where the land use is less intensive, but in localized areas erosion is prevalent and frequently serious.

In the Ozark highlands, where the rainfall is 40 to 44 inches annually with frequent heavy downpours, watershed conditions have been seriously impaired by a long history of repeated timber cutting, burning and overgrazing. For the most part the forest has been reduced to a scrubby growth of oak and hickory with little if any accumulation of litter on the ground. As a result, run-off is excessive and streamflow unstable. Flood damage to valley lands is a major problem. On the other hand, hydro-electric power installations frequently suffer from inadequate water supply during dry seasons. Seasonal water shortages also affect a large local population which depends upon wells and small reservoirs for water supply.

Watershed Management

The goal of watershed management is to put and keep watershed land in optimum condition, to conserve water for beneficial use, and

to reduce losses from destructive run-off and sedimentation. For forest lands, this means intensifying protection against fire and other hazards; planting of denuded areas, moving sand and areas subject to serious erosion; eliminating destructive logging and overgrazing; adapting timber cutting and grazing practices to watershed requirements; building suitable erosion-prevention measures on mountain roads; and installing certain protective structures.

It should not be construed that this goal implies a program which will prevent all floods or sediment damages. It is beyond the ability of the land and its cover to cope fully with conditions which cause large floods. However, good land management, supplemented and supported by minor upstream engineering works, can do much to prevent damages in smaller tributaries and can aid substantially in reducing flood flows in larger channels. Good watershed management also contributes significantly to the protection and efficiency of storage reservoirs through reducing the rate of erosion and consequent reservoir sedimentation. By helping to maintain low water flows, it assists in the development of firm power. It also provides high quality water for domestic and all other forms of use. In general, good management for timber and range is also good watershed management.

Means of Attaining Desirable Goal

Major emphasis should be on measures dealing with the forest and its soil. Such measures can increase the infiltration of water into the soil and increase the latter's storage capacity. They can also hold the soil in place. In addition, minor upstream structures, such as debris basins, check dams, gully plugs, diversion ditches, channel revetments, etc., are frequently needed to complement the functions of forest and range cover in the control of water and soil. Such complementary measures, frequently temporary in nature, are of greatest value when damaged lands are being brought back into good condition.

One of the major difficulties in building healthy watershed conditions is the lack of complete understanding and full appreciation of the inter-relations between soil, water and forest cover. Research is developing an understanding of the broad general principles which need to be adapted to the particular combinations of soils and forest cover which are found in the basin. Detailed surveys should be made of subwatersheds to identify clearly the initial signs of watershed deterioration, and to determine the impacts of different forms and intensities of land use on watershed functioning. Much of the progress that has been made so far has been by the process of trial and error, not a desirable procedure in working with such a complex problem.

A program to overcome the present shortcomings and to attain increased watershed benefits from forest lands would include such measures and services as:

1. Reestablishment of watershed cover where vegetation is lacking or inadequate, including forestation of non-commercial timber lands at high elevations, range reseeding, planting of gullies and areas of moving sand, and planting to control roadside erosion.
2. Adjustment in land use to improve management practices.
3. Intensification of fire, insect, and disease control to maintain good forest cover.
4. Additional technical assistance, facilities and service:
   (a) To provide adequate supervision and management on public lands.
   (b) To assist private owners in improving the management on their lands.
5. Regulation of timber cutting and other forest practices on private forest lands.
6. Adoption of logging methods which will safeguard water resources on all forest lands (public and private).
7. Building of new roads (including resource development roads) and relocation and improvement of the existing road and trail systems to standards which will minimize erosion.
8. Installation of structures for water and sediment detention, and soil and channel stabilization.
9. Public (federal, state, county, or municipal) acquisition of watershed lands having large public values and requiring improvement measures or restrictions in use which private owners cannot afford.
10. Expansion of research to focus on such topics as:
    (a) Determining the effect of various uses and practices under various soil and forest cover combinations upon yield, quality and distribution of water supplies.
    (b) Developing cheap and efficient methods of restoring depleted soil and forest cover for watershed purposes.
    (c) Developing improved techniques for all forest uses and practices to prevent or reduce damage to watershed values.
    (d) Determining the place of supplemental engineering measures in mountain areas.
    (e) Determining the effects of range and game use on watershed values.
    (f) Development of improved techniques in fire, insect and disease control.
11. Inventories and surveys:
    (a) Aerial surveys and maps.
    (b) Inventory of water supplies by means of an expanded network of gages and stations for measuring precipitation, run-off and sedimentation.
    (c) Survey of present and potential needs for water within the mountainous areas for domestic purposes, irrigation of meadows, wildlife, recreational purposes, etc.
    (d) Detailed surveys of watershed conditions on a subwatershed basis.

Obviously, an effective program

of watershed improvement must be carried out on all lands in need of treatment, without respect to ownership. Some of the forest measures needed, such as fire protection, must be undertaken collectively, and are generally recognized as a public responsibility, to be shared by state and federal government. The larger part of the benefits in increased water yields and reduction of flood and sediment damages accrues to lands other than those on which essential measures must be taken. The public benefits provide justification for use of federal funds to assist in installing measures on nonfederal lands and to help private owners in the application of necessary forest and related management practices. Under certain circumstances, where the costs of establishing and maintaining watershed values and protecting the public interest are larger than private owners can be expected to bear, the public should acquire ownership of the lands.

Justification of Forestry Program to Improve Conditions

Water is a major limiting factor in the agricultural and economic development of most of the Missouri Basin west of the Central Prairie Zone. The supply is far below potential needs. Diversion for irrigation in the central and upper portions of the basin and the consumptive use of water by the woodlands in the streams, adversely affects navigation and other uses in the lower reaches of the river. Widely fluctuating supplies, seasonally and between periods of flood and drought, make the use of water for power and other purposes uncertain. Where reservoirs are needed, wide fluctuations make the water supplies costly. Sediments eroded from the land and deposited in channels and reservoirs also affect available supplies and cost. Measures to conserve and augment the water supply and to equalize streamflow at a desirable level therefore demand first priority in a forestry program for the basin.

Hybrids of Sugar Pine by Embryo Culture

E. C. Stone and J. W. Duffield

Respectively plant physiologist, California Forest and Range Experiment Station, maintained by the U. S. Forest Service in cooperation with the University of California at Berkeley, and forest geneticist, Institute of Forest Genetics.

A modified embryo culture technique was used to facilitate germination of seed obtained after pollinating sugar pine with pollen from blister-rust-resistant Armand and Korean pines. Resulting seedlings appear to be hybrids.

SUGAR PINE (*Pinus lambertiana* Dougl.), a prized species in California and Oregon forests, is highly susceptible to blister rust attack. For this reason repeated efforts have been made to cross sugar pine with several of the blister-rust-resistant Eurasian white pines. In 1946, the Institute of Forest Genetics attempted a cross using pollen of Armand pine (*P. Armandi* Franch), a native of China. Two mature cones from this attempt were harvested in 1947; they yielded 115 normal-sized seeds, of which 4 were apparently filled. These were stratified for 13 weeks at 5° C. in a mixture of moist sand and peat and were planted in the Institute's nursery on May 13, 1948. None of these seeds germinated. When 8 wind-pollinated seeds from the same sugar pine seed-parent were treated in the same manner, 6 germinated. Why the seeds resulting from the cross pollination failed to germinate was not immediately apparent. Therefore, the following year it was decided to try an embryo culture technique on 7 sound seeds which had resulted from pollinating sugar pine with pollen from Armand pine and the one sound seed which had resulted from pollinating sugar pine with pollen from Korean pine (*P. koraiensis* Sieb. and Zucc.). If this technique failed it was hoped that the dissections involved might at least reveal some morphological reason for the failure.

Reported methods of increasing and hastening germination of sugar pine seed both by the embryo culture technique and by treatments other than stratification are rather confusing. Show (*3*) reported that soaking the seed in sulfuric acid was the only effective method and that this gave poor results in comparison with fall planting. Jacobs (*2*) reported better germination after using a particular water-soaking routine, but neither he nor anyone else has since been able to repeat this treatment successfully. Swensen (*5*) and Haddock (*1*) were able to obtain a small increase in germination by removal of the seed coat. Haddock (*1*) was also successful in excising embryos from fresh seed and growing a few to transplantable size on nutrient agar. On the other hand, Stone (*4*), working with 2-year-old seed, was unable to do this unless the seed had previously been stratified for 3 months at 5° C.

A recent study has somewhat clarified this picture. Data[1] from this study indicate that up to 3 or 4 months after harvest from mature cones, seed stored either at 5° C. or at room temperature will germinate immediately provided the seed coat and inner integument are removed. (Germination also took place when, in addition, the endosperm was removed. However, a more vigorous, rapidly growing seedling resulted when germination took place with the endosperm present.) As the seed becomes older the presence of the endosperm becomes inhibitory and it is necessary to remove it and use a nutrient agar to

[1]Unpublished data from a current study by E. C. Stone.

achieve germination. In still older seed (the age depending upon whether storage has been at 5° C. or room temperature) the embryo by itself is dormant, and stratification of the seed at 5° C. for 3 months is necessary.

Therefore, because the seed for this experiment had been held in storage less than 3 months after harvest, it was decided to first remove only the seed coat and inner integument. If germination failed to take place within 10 days, then the endosperm would also be removed and the embryo placed on a nutrient agar.

Procedure and Results

Seed coats were sterilized by soaking in saturated bromine water for thirty minutes, after which they were thoroughly washed in sterile water. Removal of the seed coat and all subsequent transfers were carried out in a sterile culture room; hands of the operator were covered with sterile rubber gloves.

The seed coat was cracked by pressure exerted with the thumb and forefinger along the edge of the seed; previous experience had shown that breaking in any other fashion usually resulted in damage to the embryo. After the seed coat was removed, the inner integument and the remains of the nucellus were removed with a pair of forceps. The embryo with the surrounding endosperm tissue (Fig. 1,e) was then placed on a 1.5 percent plain agar slant contained in a 25 by 150 millimeter rimless test tube. The test tubes were stoppered with cotton plugs and placed on racks in the laboratory in diffused light at a temperature of approximately 26° C.

The slants were examined daily; growth was first noted on the sixth day with the appearance of the radicle. The presence of the endosperm was apparently not inhibitory in this instance.

When the roots were approximately 3 cm. in length (Fig. 1, e) the seedlings were transferred to quart cans filled with previously fumigated soil. These plants were then placed in the greenhouse for six weeks (Fig. 1, f), transferred to gallon cans, and then placed outside in the nursery.

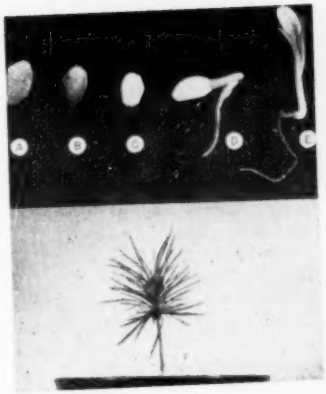

Fig. 1.—Various stages of embryo culture. *a.* intact seed; *b.* seed coat removed; *c.* seed coat, inner integument, and nucellus removed; *d.* embryo at end of 12 days; *e.* embryo at end of 16 days, immediately before transfer to soil; *f.* seedling 40 days after transfer to soil.

Two seedlings resulting from the cross between sugar pine and Armand pine died during the first summer, probably as a result of injury in handling; the remaining five, and the one seedling from the cross between sugar pine and Korean pine are growing well.

Discussion

The failure of the 1947 seeds to germinate cannot be explained; the embryos in the 1948 seeds were normal in every way, and there was no evidence of incompatibility between the embryo and endosperm.

Work on this phase of the problem is being continued.

All the seedlings have produced needle fascicles during the first summer and the dorsal surfaces of the needles are without stomata. As this is not characteristic of sugar pine but is of both Armand and Korean pine, it suggests but does not prove that the seedlings are indeed true hybrids.

There is no reason for believing that in this case germination would not have taken place had the seed coat been removed and the endosperm-encased embryo placed directly in soil. However, this would still require sterile conditions which are more conveniently obtained with agar slants than with cans of soil. In this respect it is interesting to note that once the embryo starts growing it thrives quite well on nonsterile soil provided it is protected from damping off against. Another reason for using agar slants was the chance that the embryo might be dormant when the indosperm was present. Then it would have been necessary to excise the embryo and place it on a sterile nutrient agar—a procedure impossible to follow if the endosperm-encased embryo had been originally started in soil.

Use of an embryo culture technique is of definite value when only one or a few seeds are available and a high germination percent is necessary. It is quite possible that if in addition to this practice, a chilling treatment is given the greenhouse-grown seedling when it enters the dormant period, a 2-year-old sized plant can be obtained within a year. This is an important consideration in any plant-breeding program.

Summary

1. Seeds were obtained after pollinating *P. lambertiana* with pollen from *P. Armandi* and *P. koraiensis*.

2. Germination of these seed soon after harvest was facilitated by a modified embryo culture technique.

3. Resulting seedlings appear to be hybrids because (a) they produced fascicles in the first summer and (b) the dorsal surfaces of the needles are without stomata—both characteristic features of *P. Armandi* and *P. koraiensis* but not of *P. lambertiana*.

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Notes

Two Useful Tools in Forest Research Work

Two adaptations of Swedish forestry tools have been used successfully at the Boise Branch Station at Idaho City in southern Idaho. They are a folding Christen hypsometer and a tree slapper (Fig. 1).

The Christen hypsometer was made out of two pieces of 1/16-inch brass, each 1 inch by 8 inches, held together with a copper rivet through a 1-inch overlap. Graduations were calculated for a 10-foot pole and marked by using a hacksaw. Top and bottom notches were made by hack-saw and file. Scale graduations were stamped on by 1/8-inch steel dies.

A hole drilled through the instrument at the top holds a loop of thong which suspends the instrument freely when in use and allows it to be hooked to a belt in a folded position when not in use. A red or yellow band painted across either tip and on the back side lessens the chance of losing it in the woods. Unfolded length is 15 inches.

The tree slapper is a vast improvement over the lime "sock" because of facility of use, moisture-resistance, and stoutness. It consists of a leather pouch, approximately 4½ inches by 6 inches with a 2½-inch neck, which is neither completely rigid nor too pliable. Into the neck is fitted a 12-inch length of hoe or broom handle. The length of handle within the pouch (some two-thirds of the total length) is sawn lengthwise through the center to provide resilience when struck against a tree. For the same length and parallel to this cut, the round sides are faced. It is important that all seams and the neck opening of the pouch be closed to prevent the escape of powder.

On one side of the pouch, 2½ inches from the bottom, a 1¼-inch diameter hole is made over which is placed a piece of No. 80-90 gage brass wire screen. Framing the hole and over the wire netting a round or square ¼-inch thick piece of leather is stitched securely to the side of the pouch. This raised lip of leather above the wire screen serves to protect it from puncture and pitching up.

When the pouch is filled with red lead or some bright colored oxide (yellow or blue is recommended), a circular dot the size of the opening is made on whatever is slapped. The slapper can be used for about four hours if trees are struck once.

There are several advantages of the tree slapper for marking trees temporarily. Trees can be marked with ease and safety as fast as a man can walk, the boles are not injured, and different designations can be made by striking in patterns of more than once. If the slapper is properly used, the marks will endure on a stem after considerable rain because powder is driven into the bark crevices by impact. With reasonable care the powder does not become clogged by dampness.

The writer has used tree slappers, both home-made and saddlery-made, in the Pacific Northwest, Maine, and southern Idaho with equally good results.

JAMES D. CURTIS,
Intermountain Forest and Range Experiment Station.

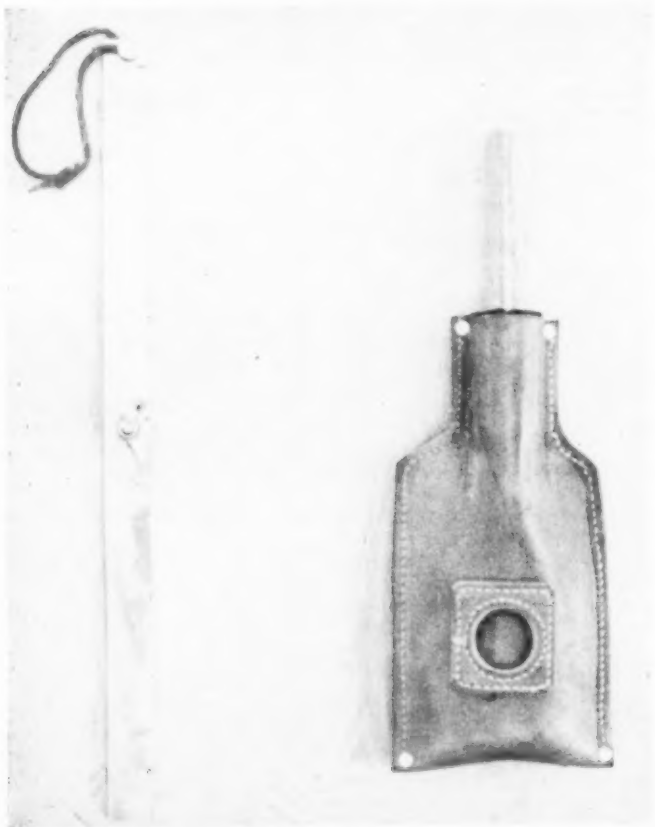

FIG. 1.—*Left*, home-made brass hypsometer for measuring tree heights; and *right*, tree slapper for marking trees, lines through woods, or trails.

Four Challenges for German Forestry

There follows a rather free translation of a short article by Reinhold Jahn in the *Göttinger Universitäts-Zeitung* of June 1949 (4th year, No. 6, p. 9). It represents the stand of the principals of the Society for the Protection of German Forests. A section of this society was formed at Göttingen on March 8, 1949.

The translator believes the article to be of interest to Americans because it shows how greatly the Germans respect their forests, how they recognize their economic value, and how carefully German forests are managed in normal times. The article, unconsciously, also demonstrates a peculiar attitude in that it was apparently all right to save one's own forests at the expense of the forests of an occupied people — Poland in this case—and in that it shows bitterness toward having the tables turned.

The translation follows:

"When one reviews the development of our forestry during the past 15 years, three phases can be recognized:

1. The period between 1934 and 1939.

2. The war period.

3. The period after the collapse.

"1. Until the year 1933 the German forests had been maintained in well-tended condition according to a carefully applied system of forest management and conservative harvesting. The annual cut from these forests was set by rigid working plans, and any wood that was needed in Germany beyond that amount, was imported. The imports accounted for more than one-fifth of total requirements.

"The trend toward autocracy, which accompanied national socialism after 1933, did not overlook the forests. It was pointed out that our forests contained some easily accessible mature growing stock that need only be harvested to make imports superfluous. Consequently, the annual cut was increased from 100 to 150 percent of the yield, thereby saving most of the cost of imports.

"2. Then came the war and with it an increasing demand for wood. Frequently it was assumed that the occupation of Poland would free Germany from any wood scarcity. Actually, it was found that the condition of the growing stock was such that no help could be expected from that quarter. This, was also true of most of the countries and sections overrun by Germany, with the exception perhaps of the Baltic countries and parts of the Balkans. But, as much as these countries could add to the wood supply for the war operations, it was still necessary in Germany to continue removing 150 percent of the normal cutting budget.

"At that time, too, because of a directive forbidding the peeling of felled timber, conditions developed that were favorable to serious outbreaks of bark beetles in the spruce forests, so that, today, one sees entire forest areas falling prey to these destroyers.

"3. With the cessation of hostilities and the complete collapse of industry and commerce in Germany, wood became of vital importance to everyone—without the forest and the fuel it provided, many would have succumbed during 1945-1946.

"There has been considerable variation in the amount of wood products pledged to the occupying powers for export from the several occupation zones. The British Zone has been hit particularly hard, since wood-poor England, whose forests were severely decimated by the war, has shown a keen interest in this wood export and has enforced it until very recent times. Although the quantity of these exports make up but a small percentage of the total cut, one must bear in mind that they are produced in the most valuable assortments.

"The sorest spot in German forestry, is occasioned by the export of products from the French occupation zone. The stands of the Black Forest, in particular, are suffering a heavy drain. It is bitter for us to hear that these wood products are sold to foreign countries by the occupation authority to strengthen its dollar position.

"The abnormal conditions that have prevailed in the German forest for the past three years, are evident everywhere.

"Lumbering during the years 1945-1948 produced the following volumes by zones:—

	Mill. f.m.[1]	Percent of normal increment
Russian Zone	52	220
French Zone	39	284
U. S. Zone	61	186
British Zone	42	333
Total	194	235

"Should we wish to plan our forestry according to the standard of the past 100 years, we must balance the cut with the final yield, *i.e.*, refrain completely from cutting the older trees for a long period of years, and restrict ourselves to the removal of defective material and thinnings from the younger stands. Such a radical step may not be possible since it would mean, in large part, the break down of our wood-using industries. The need for it however indicates the utter bankruptcy of the entire forest estate, the operation of which, without monetary returns, would have to be discontinued and the foresters and woods workers discharged.

"In consideration of the above, four challenges must be met:

1. No more wood can be exported.

2. Economy in the use of wood is imperative.

3. Wood, in adequate quantities, must again be imported.

4. The denuded areas must be reforested as quickly as possible.

"1. The first requirement is an appeal to the economic intelligence of the occupying powers. If Germany is to take her place again among the peoples of the world, if she wishes to improve her living standards significantly, adequate steps must be taken toward a wood economy.

"2. Even as we must make demands upon the occupation powers for our forestry and wood economy so must we also make demands upon the German people.

"3. Imports of raw wood from foreign countries must be resumed just as quickly as possible. Invoking the Marshall Plan would no doubt assist in making this possible.

[1]Fest (cubic) meter.

It already appears that there will be a scarcity of wood in the world during the next few years. The coniferous forests, found only in the northern hemisphere, are hardly in position to meet the overall requirements for wood, as long as Russia (Siberia) will not enter into international trade.

"4. Reforestation of the immense clear cuttings, in Germany, will cause much work and many headaches in the coming years.

"There is nothing else to do, in most cases, but to reforest with uniform, unmixed coniferous stands. Even if the problems of plant production and seed collection can be relieved, the provision of necessary manpower still will cause great difficulty.

"For us Germans the forest is more than just an economic good. Its destruction, or even its impairment, would mean an irreplacable loss for all of us. Its preservation and its rehabilitation are among the most important tasks of our time."

EMANUEL FRITZ,
University of California.

Rainfall Interception By Chaparral in California[1]

Determination of rainfall not reaching the soil, called interception loss, is important in the solution of water-supply and flood-control problems. Interception loss in shrub types of vegetation was measured at three locations in California. On one area in the Sierra Nevada foothills in central California 81 per cent of an average annual rainfall of 42 inches reached the soil by falling through and dripping from the brush cover, 14 percent reached the soil by flowing down the stems, and 5 percent was lost as direct evaporation from the vegetation. On another area in the same vicinity with a different type of brush cover, 62 percent of an average annual rainfall of 38 inches reached the soil as throughfall, 30 percent as stemflow, and 8 percent was lost by interception. In the San Gabriel mountains of southern California, 81 percent of an average annual rainfall of 22 inches reached the soil as throughfall, 8 percent as stemflow, and 11 percent was lost by interception. Amounts of throughfall, stemflow, and interception loss varied directly with storm size. However, the proportion of interception loss varied inversely with storm size. An equation of interception loss for storms of more than 0.3 inches is given for each study area. The interception process is explained by analysis of typical storms during which running records were made of rainfall, throughfall, stemflow, and interception storage.

E. L. HAMILTON and
P. B. ROWE.

[1]Authors' abstract of bulletin. Calif. Dept. of Natural Resources, Div. of Forestry in cooperation with U. S. Forest Service, Calif. Forest and Range Expt. Sta. 43 pp. illus. 1949.

The Application of Line Thinning

Recently in the United States, with the maturing of coniferous plantations to pulpwood and post sizes, the problem of extraction of the thinnings from close-spaced stands has led to the adoption of the practice of removing all the trees in single rows regardless of their relative dominance or suppression. The question then arises as to whether the remaining rows should be thinned at the same time.

Flentje and Gough[1] have described the results and conclusions from a carefully planned experiment in 22-year-old plantations of Scots and Corsican pines in Britain, a technique new to British forestry in 1946, and termed line-thinning. The recognized advantages of lessening the costs of selection, felling, and removal of produce, plus providing future access roads, is accompanied by the drawback of cutting a certain number of dominant or crop trees. The British investigated this factor by tallying the crop trees that were taken if every third row was cut clean and found that the crop trees remaining on the two uncut rows varied from 1 in 5.9 trees to 1 in 1.2 trees depending on species and site, with the poorer sites showing the least differentiation. Corsican pine required fewer trees for the final crop than Scots pine.

Based on the number of crop trees per acre required for final yield, the lower the ratio between crop and other trees, the greater the inroad on crop trees made by a row cutting. In each case, thinning was carried out in the rows between the clear cut strips. As the result of the test, rules were worked out to indicate the most desirable spacing of the line thinning. For a high ratio between undesirables and crop trees, above 4 to 1, the removal of every third row is advocated, and thinning of the two remaining rows is postponed until the second operation. Between 3 and 4 to 1 calls for the cutting clean of every sixth row, with thinnings in the remainder. Where the ratio is between 2 and 3 to 1, every ninth row is cut, and when the "selection factor" falls below 2, either line thinning is abandoned or is placed 12 rows apart, solely for purpose of access.

Line thinnings have been practical within the past 3 years at both the Yale and Harvard experiment forests, the former on the Eli Whitney Forest and the latter at Petersham, Mass., but this method of adjusting the row interval to the dispersion of dominants in the stand appears to have been given no attention in America so far.

H. H. CHAPMAN.

[1]Flentje, Wm. and P. G. Gough. The Application of Line Thinning to the Forests of East Anglia. Empire Forestry Rev. 25:202-213. 1946.

New Technique for Interpreting Aerial Color Photography

Aerial color photography is currently considered impractical by most forest photogrammetrists because (1) the narrow latitude of exposure imposes a high risk of failure in attempting to obtain color photography; (2) cost of the photographic film and of processing is relatively high; (3) stereoscopic study of color transparencies requires special viewing equipment; and (4) multiple reproduction of prints from color transparencies is relatively costly and diffi-

cult to accomplish. Many foresters agree, however, that these disadvantages would be more than offset if valuable forest data not obtainable from conventional black-and-white photos could be extracted from good color photography, thereby eliminating costly field work.

Recent tests demonstrate that such additional data can be obtained from color photography in certain instances by viewing the color transparencies through appropriate filters.

For example, a certain species of vegetation, the distribution of which is to be mapped, may photograph with a consistently yellowish-green cast, whereas its associates register in other shades of green. This difference can be accentuated by viewing the color transparencies stereoscopically over a light table through a filter which screens out the green light and transmits the yellow. The result is to increase tonal contrast by making plants of the one species appear much lighter in tone than those of all associated species. Additional species may be identifiable, one species at a time, by re-examining the same color transparencies through other filters which transmit only those wave lengths of light for which the species in question exhibit unique reflectance.

Similarly, under certain conditions the detection of insect-infested trees in a stand of green timber or the mapping of uniquely colored soils may be facilitated by thus viewing the color transparencies stereoscopically through the appropriate filters.

Long wave lengths of visible light are almost completely absorbed by water but are largely reflected by foliage. In examining color photography the use of filters which transmit only these long wave lengths may increase tonal contrast between water and vegetation and thereby facilitate recognizing swampy areas or determining the exact course of streams which are overhung by trees.

Short wave lengths of visible light account for most of the illumination of shaded areas. By increasing the light intensity beneath a light table and examining color transparencies through filters which transmit only short wave lengths, detail in the shadows may be more readily discernible. In forested areas this will facilitate contouring, tree height measurement, delineation of roads and trails, interpretation of the forest understory, and many other phases of aerial photo interpretation which require detail in the shadows. However, in dealing with the shorter wave lengths of visible light two limitations are imposed: (1) the human eye is relatively insensitive to short wave lengths; and (2) aerial haze preferentially scatters the short wave lengths, thereby creating a weak and blurred photographic image. For these reasons attempts are currently being made to procure experimental aerial color photography from a photographic aircraft equipped with an artificial source of illumination similar to the Edgerton Flash Unit used in night photography during World War II. In this case it is proposed to use a flash unit which is rich in the longer wave lengths of light, for daylight photography, merely to increase sufficiently the illumination in areas obscured from the direct rays of the sun, to facilitate photo interpretation in these shaded areas.

Tests conducted by the writer to date on the viewing of color transparencies through a variety of filters, while giving very promising results, have been on too limited a scale to permit broad generalizations as to the usefulness of the method. The writer would be very grateful for information sent him by those who may find opportunity to conduct similar tests.

Robert N. Colwell,
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University of California.

Chlordane Effective in White Grub Control

If used with care, chlordane is a good material for the control of white grubs in some forest soils, according to a report by R. D. Shenefelt and H. S. Simkover, entomologists at the University of Wisconsin.

In both greenhouse and field trials chlordane-treated seedlings were normal in every way when grown in Plainfield sand. However, when the seedlings were grown in white sand, the roots were affected by the treatment, they reported.

Lead arsenate and benzene hexachloride were more severe. Norway pine seedlings grown in white sand treated with lead arsenate were dead within two weeks. At the end of two months the seedlings in benzene hexachloride-treated white sand were twisted and stunted. In white sand, the tops of chlordane-treated seedlings were normal, but the smaller side roots were absent.

In the Plainfield sand with seedlings grown in the greenhouse, they found that lead arsenate and benzene hexachloride still damaged the plants severely, but that plants in chlordane-treated soil were normal.

Tests of these three materials on four evergreen varieties in state nurseries showed about the same results, they reported.

International Forestry Library Re-established

The extensive forestry library which formerly belonged to the International Forestry Centre (C.I.S.) has now become the property of the Food and Agriculture Organization of the United Nations and has been established in Geneva at the European Forestry and Forest Products Office of FAO, Palais des Nations.

This library is open to all forestry specialists who wish to consult it. Catalogues are being brought up to date and it is planned to publish a list of books available for consultation and a list of those available for exchange.

Because the International Forestry Center Library discontinued its activities in 1945, the center now is in need of books and publications issued since that time. It offers exchange sets of the library's former publications: *Bibliographia Forestalis, Silvae Orbis,* and *Intersylva.*

We Present

Dwight B. Demeritt

Dwight Burgess Demeritt, son of a Maine farmer and cattle dealer, student, instructor, professor, and forestry department head, has always desired action more than words. He has been willing to make drastic changes in position and location to push forward in his goal of better forestry in the woods. For better health and diversion, Dwight, "D.B.," or "Prof.," fishes, gardens, and attends athletic contests.

Dwight was born in Sangerville, Maine, on August 13, 1898. On entering the University of Maine in 1915, after graduating from Foxcroft Academy, he tried other courses before settling on forestry. His grades were always high, whatever his course. World War I interrupted his college career. Again his service choice was different than the usual for he served 14 months on Submarine Chaser 137 in the English Channel. "D.B." returned to the University of Maine after the war to receive his B.S. in forestry in 1922. Pulling currants and gooseberries during summers in the early days of the white pine blister rust project convinced him that he could and would master other forestry arts, so he went to Yale Forest School and received his M.F. in 1923. He early developed a desire for new ventures and tried them freely. His Yankee trader background probably gave him his ability to see opportunity and a desire to do something about it.

At the University of Maine, he joined the Lambda Chi Alpha social fraternity. He was honored in being made a member of Xi Sigma Pi, Sigma Xi, and Phi Kappa Phi because of his high grades in college.

John Briscoe, then head of the forestry department at the University of Maine, when introducing "D.B." to his first class on his return to the University as instructor, just after his graduation from Yale, said, "This is the man who was called 'Weary' here at Maine but proved so good at Yale we asked him back to teach you how he did it."

At Yale, Dwight made many friends among the faculty. A special friendship was started with H. H. Chapman. This led to Maine fishing trips, but more important to forestry was their joint authorship of *Elements of Forest Mensuration*. The first edition was written in 1932 and the second in 1936.

Photo by Ted Nowhall
Dwight B. Demeritt

Dwight brought Ethel W. Williams as a bride to the banks of the Stillwater River in 1925. It was probably a combination of his desire to do things in forestry, a desire to show Mrs. Demeritt his abilities, and his Yankee trader instinct that soon started him on the road to see the forests and study their problems over much of the country. From 1923 to 1934 Dwight worked for four different universities and had seven titles.

Leaving the University of Maine he went to the deep South as extension forester of Louisiana, then north to Penn State as associate professor, west to Iowa as associate professor, and finally back to the banks of the Stillwater as department head.

These changes gave him an opportunity to see forestry as it was being practiced in every region of the country. Perhaps most important of all, he became acquainted with forestry leaders. This gave him an opportunity to discuss with them how to get more forestry into the woods.

It is only natural that his greatest achievements to date have been at the University of Maine where he spent 16 years. Upon his return to the University as Forestry Department head in 1934, the department had two assistant professors and had failed to make Grade A rating among forestry schools. He soon built up the forestry faculty in numbers and reputation to give it a Grade A rating by the Society of American Foresters committee on rating.

"Prof.," as he became known to his students, brought about the establishment of a cooperative wildlife management course in the University of Maine Forestry Department. Several of its graduates are now helping to formulate the wildlife and fisheries programs of Maine and nearby states. Another outstanding achievement was his engineering the purchase and leasing to the University of land by the federal government to establish a 2,500-acre University Forest within three miles of the University campus.

He still found time to be a tough and respected forest mensuration teacher. Students all agreed that anyone who passed his course had to know their math and work for their grade.

When James W. Sewall found that "D.B." was leaving his job as department head to become a woodlands manager, he said, "Who is going to answer all our technical questions?" Since 1928, Dwight has served as consultant to many lumber and consulting forestry firms. His quick, clear, analytical mind is always in demand for information on growth and valuation statistics.

In 1944 and 1945, Dwight was

with the War Production Board handling pulpwood problems in the Northeast. This gave him a good insight of that industry's problems and acquaintance with many of their leaders. His grasp of figures and their significance soon won the respect of business leaders. This gives him much credit, for leaders, especially in the pulpwood industry of the Northeast, are usually fearful of the pedagog and professor.

Dwight returned to the University of Maine to help re-open the Forestry Department following the war.

However, he had seen new opportunities to advance the practice of forestry in the industrial field. He had become convinced through War Production Board work that men with an academic background could have a beneficial influence in charting woodland management programs for industry. In 1946, "D.B." affiliated with the Dead River Company, of Bangor, Maine, as woodlands manager. One of his accomplishments to date is working out the details of an agreement between the Dead River Company and the Eastern Corporation whereby the first company agrees to sell its pulpwood to the latter for a long term, cutting to be done under the direction of the owner. The unique feature is that the wood purchasing company agrees to pay a yearly fee to be used for forestry improvements on the land. He spearheaded the acquisition of an experimental area near Bangor, Maine, purchased and owned by nine companies, leased to the Northeastern Forest Experiment Station. Only industry's confidence in him and his perseverance has made this cooperative project possible. These examples of projects to improve forest practice in the woods have rewarded his courage to change his occupation from professor, after 23 years, to woodlands manager.

He has reached a place of importance and leadership in industry in a very short period. The respect and value of his leadership abilities is evidenced by his present membership on important committees. He is a director of the American Pulpwood Association, a member of the advisory committee of American Forest Products Industries, of the advisory council of the Northeastern Forest Experiment Station, serving as chairman 1947-49.

"D.B.," in spite of his very active life as teacher and woodlands manager, has found time to know the best trout streams and lakes in Maine and New Brunswick. There is nothing he enjoys more than a few hours' fishing with his 20-year-old son "Demi," "D.B., Jr." Like all good fishermen, his stories are well known among his neighbors and friends.

Athletics have been one of his many hobbies. He served on the Athletic Board at the University of Maine as a faculty member. Sometimes on a trip to Boston he works in a baseball or hockey game.

On the banks of the Stillwater River, in Orono, is the most beautiful garden of the whole surrounding area. Although "D.B." takes great pride in showing the Demeritt garden, when questions are asked about annuals, perennials, and shrubs he has to refer to the "Mrs." Although Dwight likes to be and is usually tops in any field of work in which he is interested, he has to doff his cap to Mrs. Demeritt, as do most others, when it comes to ornamental horticulture. However, Mrs. Demeritt has not allowed him to forget how to use the hoe and shovel.

He has given freely of his time and abilities to civic and professional organizations. He has always taken an active part in the Society of American Foresters. He served as chairman of the New England Section and in 1948 was chairman of the program committee for the National Society meeting in Boston.

As a newly-elected member of the Council of the Society, for the two-year term 1950-51, it is a foregone conclusion that "D.B." will give untiringly of his energy and judgment to the national affairs of the Society.

Dwight Demeritt, a Maine Yankee, has toured and worked in most forest regions of the country in order to gain experience and extend his forest knowledge. His matured judgment has won the respect of industry and the public alike in his native state. He is helping to prove that good forestry is needed and can be sold to private woodland owners. He has shown his abilities as an organizer and coordinator, both in the teaching field and in private industry. This forester, sportsman, and conservation-conscious leader has done much in 30 years and, fortunately, has the opportunity and desire to continue his good work and influence. His actions and accomplishments speak for him.

L. J. FREEDMAN
A. D. NUTTING

Points of View

Watts Discusses Referendum on Federal Regulation

I

The proponents of the referendum on regulation announced in the February JOURNAL have posed a question which is not clear cut. They are seeking a "yes" or "no" answer on an issue in which past discussion has developed at least three well-defined points of view: Those who believe forest regulation should be left solely to the states; those who favor federal regulation exclusively; and those who advocate a combined federal-state system with ample opportunity for the states to carry the public responsibility for keeping forest lands reasonably productive. The last might be subdivided into those who simply favor federal financial aid to the states in the administration of regulation and those who would establish federal standards as the basis for financial aid and provide authority for federal administration of regulation in states which requested it or failed to meet the federal standards.

The Council recognized the ambiguous nature of the question and asked the proponents of the referendum to modify it. It is difficult to understand why the proponents insisted on the original question after its ambiguity was called to their attention.

The issue might be sharpened by restating it to read, "Should the federal government take any part in the regulation of cutting and other forest practices?" To this question most of those who feel that regulation is necessary — and a previous referendum in 1944 showed that a majority of the Society of American Foresters does — would, I think, vote "yes." And they would vote "yes" whether they believe in outright federal control, whether they support the federal-state system advocated by the Forest Service, or whether they simply favor federal financial aid to the states in the administration of regulation following the pattern of cooperative forest fire protection. They would vote "yes" because forest conservation is so vital a national problem and, believing that regulation is necessary, they would want to enlist the strength and influence of the federal government in achieving its nation-wide application.

II

Because the petition and the question as posed by the referendum tend to evoke a response on outright federal regulation rather than on federal participation, I wish to clear up any possible misunderstanding of where I stand by restating the Forest Service position with respect to state participation in public regulation.

The Forest Service believes that the national interest will be well served if all the states have strong forestry departments functioning effectively in regulation of cutting and other forest practices on private forest lands as well as in other forestry activities. The Forest Service has consistently worked to help the states build up effective forest fire protection, technical assistance to private forest owners and operators, and other activities. It stands ready to help in developing effective state plans for regulation.

The Forest Service advocates federal participation in regulation because it believes there should be nation-wide application and because it believes that federal action will be needed in some states to get satisfactory standards applied. The Forest Service advocates a federal-state system of regulation in which certain standards would be set up as guides in the formulation and application — by the states — of rules of forest practice adapted to local forest conditions. The states would have opportunity to formulate their own plans for handling regulation in conformity with prescribed requirements. If the plan submitted by a state meets these requirements, the federal government would offer financial aid, on a matching basis, for the administration and enforcement of the plan by the state. On the other hand, in the Forest Service proposal, the federal government would undertake regulation in any state which did not adopt and put into effect a satisfactory plan of its own within a reasonable period.

I am firmly convinced that this federal-state plan is the best approach. It has had the endorsement of the last four Secretaries of Agriculture and of the present Secretary of the Interior.

It should be emphasized that the federal-government has authority to establish forest practices on private forest lands. The basis for such action is primarily the federal commerce power. There is ample precedent in the Federal Food, Drug and Cosmetic Act; the Packers and Stockyards Act; and in other fields. But under the Forest Service proposal, the federal government would not administer regulation except when the states do not act.

So, if you vote for federal participation in regulation on the basis advocated by the Forest Service, you are not voting against state regulation.

III

Neither the petition nor the referendum questions the need for public regulation. Nevertheless it is well to restate certain facts before discussing the basis for federal participation in forest regulation.

The need for public control of cutting and other forest practices has been widely recognized and repeatedly stated during the past 10 years or more. The Society of American Foresters adopted a statement in December 1940 which was reaffirmed by the Council in 1943 and approved by the membership in 1944. The Joint Congressional Committee recommended federal legislation in 1941 after exhaustive hearings in Washington and other parts of the country. Some 14 states have forest practice acts. The program of the American Forestry Association, enunciated

following the American Forestry Congress in 1946, declared the need for forest regulation although the recommendation was only in terms of state action. The recommendations of the Forest Service for a federal-state plan of regulation have been reaffirmed as a result of its Reappraisal of the Forest Situation in 1945-1946.

In all these declarations, regulation was only one element in a comprehensive program of many-sided action to reverse the national trend of forest depletion and deterioration. It has not been advocated as a panacea or as a substitute for public cooperation, education, and technical assistance to private owners, or for more public ownership. Regulation is needed because all these other measures have not been sufficient in reversing the trend of depletion and deterioration. And, as forest deterioration and growing-stock depletion become more acute, the problems of forest restoration become more difficult and the need for regulation more urgent.

Scarcity is already at hand. We need only face the problem of building a new home at today's prices or feel the pinch on our pocketbooks when we buy the simple lumber requirements for ordinary household repairs or improvements. Lumber prices are 3 times higher now than they were 10 years ago. Indices of the Bureau of Labor statistics show that wholesale lumber prices increased twice as much as all building materials (including lumber) in the decade 1939 to 1949. It does not take an economist to know that a lot of this extra rise is due to scarcity: the readily available timber supply has not kept pace with demand.

As foresters we know that, for the future, supply must be considered in terms of annual growth. Also that usable growth depends upon merchantable growing stock. Adequate annual growth will not be attained so long as we continue to destroy or impair productive growing stock by premature harvesting of young timber or by cutting methods which do not provide for restocking or which leave the land in possession of inferior or worthless growth.

The oft-asserted claim that an improved economic climate for forestry will of itself lead to the widespread adoption of good forest practices is certainly open to question. As often as not, better markets for timber, which improve the opportunity for good forestry, actually result in heavier cutting and accelerated depletion of basic forest capital or growing stock.

We cannot brush these facts aside by pointing to the progress that has been made in forestry in recent years. Progress has been substantial—perhaps more has been accomplished in private forestry in the past 10 years than in all the years before them. But this does not make the need for regulation less urgent. Pressure on essential growing stock is as great as ever. Good timber is increasingly difficult to find. Destructive practices have not been stopped. Nationally, our forests are still on the down grade. Because of the urgency of the situation, I am convinced we can no longer afford to temporize.

IV

The justification for federal participation in forest regulation stems from the fact that forest conservation is a basic national problem. Adequate forest resources are at the root of national strength and security. Productive forests have an important bearing on human welfare and our standard of living. Forest products are important in interstate commerce. The people in Iowa and Kansas are concerned about forest productivitiy in Oregon, Minnesota, or Louisiana just as the rest of the country is interested in the corn and wheat that Iowa and Kansas produce. As the President has said in his recent Economic Report, "Economic stagnation anywhere is an injury to the whole economy."

Furthermore, the watersheds which provide hydroelectric power to turn the wheels of industry and water to irrigate agricultural crops do not conform to state lines. In many places municipal water supplies also present interstate problems. It is just as important to protect forests from destructive cutting for flood control, the regulation of streamflow, and the conservation of water supplies as it is for timber production.

The history of our country since its founding has been marked by an increasing necessity for use of the federal constitutional power to deal more effectively with various segments of national life. One reason for this has been the development of the industrial economy which brought with it a greater degree of interdependence among the states. More recently the experience of total war makes it clear that international affairs are increasingly important to our welfare. As the dimensions of our economy grow larger, government inevitably will be called upon to exercise broader controls to fully serve our best interest.

The tempo of our economy has also been greatly stepped up. The national output of goods and services is now over 250 billion dollars annually—3 to 4 times as much as it was in the 1930's. As the pressure of the nation's economy on its resources becomes more insistent, conservation measures must be progressively more positive.

We cannot safely rely on independent state action alone to deal with an issue that so vitally affects future national welfare. Too few states have thus far felt responsibility for private forest regulation. And of the state forest practice laws that have been enacted, too few are really effective. Too often the people of a state have been led to believe their forest practice law would solve the problem, when in reality it may require little improvement in forest practices. Experience thus far provides small basis for the hope that state regulation without federal participation ever will be generally effective. At best, independent state action is likely to be responsive primarily to local needs and political pressures. It will not be based on a national outlook or concerned with interstate problems.

The flurry of state laws enacted in the period 1941 to 1945 seems to be related to the prospect of federal action raised by the investigations of the Joint Congressional

Committee on Forestry and by subsequent legislative proposals. There has been little growth of state regulation since 1945. Thus we already have evidence that the spotty and halting progress of regulation in the states needs to be bolstered up by federal leadership and participation in this field.

Federal participation in forest regulation does not imply nationalization of the forest industries or of the forestry profession. It does not mean acquiring forest lands that private owners desire to hold. On the contrary, by providing for nation-wide application of adequate standards of forest practice, it will help sustain private enterprise and competition in our forest industries. It will contribute to the security and stability of private employment in these industries.

I am sorry the referendum has been worded the way it is. Let me emphasize that the real question is whether or not there should be *federal participation* in regulation, rather than whether or not there shall be state regulation. You can vote *for* federal participation without voting *against* state regulation. I hope no one will be misled by any implication that the referendum reduces the issue to a simple choice between state and federal regulation.

LYLE F. WATTS,
Chief, U. S. Forest Service

More Comments on Federal Forest Regulation

Having read Charles Stoddard's comments in the November 1949 JOURNAL, I feel impelled to present another view.

We need more men with courage like H. H. Chapman. Of course, he tells only the opponent's story. The affirmative viewpoint has been told directly and indirectly for years, and the money to do it has come in part from our own pockets. Movies, leaflets, folders, charts, lectures, news articles—every means has been used to scare the public.

Can Stoddard prove to me that all the clearcutting he talks about was bad? Did he check the soil, fire history, growth, and other factors, or was this a roadside guess? Doesn't the experiment station recommend clearcutting in aspen; also other species when conditions warrant? Don't national forests permit clearcutting on thousands of acres yearly?

Does he expect immediate compliance with state cutting laws or even a federal law? Doesn't everyone break a law now and then? Is there complete compliance with speed laws; was prohibition complied with; are crimes nonexistent? Did he ever read about the broad arrow in Colonial times? What happened when the British tried to regulate cutting of pine timber? Did the colonists comply?

Has he checked to see how many hundreds of land owners have complied with state cutting laws? Perhaps we are prone to notice the heavily cut areas. How many owners have not cut at all because of state regulations and now have a blow-down on their hands?

I am not yet convinced that the Forest Service research was objective unless Stoddard means it was done with an objective in mind. Many do not agree with it. Who gave the U. S. Forest Service the public trust he refers to? When did the Forest Service jump its boundaries and come onto my land? Perhaps it hasn't enough to do on the national forests.

Stoddard says in effect that the majority is never wrong. He must not read newspapers or he would know how many democracies have fallen to dictatorships. Majorities can be controlled. How does a dictator come into power if not by control over everyone?

He says every cutting control measure yet proposed would not have a retarding effect on the really sincere forestry efforts made by so many concerns. I flatly disagree. What if Uncle Sam's foresters want me to grow sawtimber and I wish to grow pulpwood? What if I wish to grow cedar posts and they want me to grow cedar poles? Would they be any easier to convince than O.P.A. was, or the Bureau of Internal Revenue, or other federal agencies?

He says, education alone cannot cope with the worst effects of commercial cutting. I say legislation alone cannot, either. If I had to make a choice, I would pick education. He makes it appear that education has been tried and has failed. This is not a fact. Have we sold forestry; have we used modern selling methods; has the Forest Service really tried to sell forestry? We must agree a negative approach is poor selling technique.

The chief of the U. S. Forest Service has hurt his department, and forestry as well, by continuing to attack the industry. We should be working wholeheartedly with him, and could if he would bury the hatchet. It is his move.

I have seen real results from extension forestry programs, on-the-ground forestry service, school forestry, trade association work, Keep Green movements, and Tree Farm programs. Stoddard has seen the Trees for Tomorrow program work in Wisconsin. Has he visited the states which have undertaken the More Trees program. Isn't education coming into its own?

I will go along with him on his proposed vote if the voting is confined to those who make the majority of their living from their own forest land. Neither of us could qualify for this, and do not deserve to, since only the owner facing stark, economic realities should decide his own fate.

Our greatest threat today is not Big Business or Big Labor; it is Big Government. The book *Mainspring*, published by the Economic Foundation, Irvington-on-Hudson, New York (price $1), will show what makes our great country tick. He will see clearly what has caused the downfall of every great empire in world history.

Every forester and thinking American should read this book before voting for federal cutting regulations or any other law which destroys human freedom.

JOHN V. HOENE,
Timber Producers Association, Duluth, Minn.

Reviews

Forest Mensuration.

By Herman H. Chapman and Walter H. Meyer. 522 pp. Illus. McGraw-Hill Book Company, New York. 1949. $5.

No two men in American are better qualified to write a text on forest mensuration than are Professors H. H. Chapman and W. H. Meyer, both of the Yale School of Forestry. With this text they present to the profession a very instructive, serviceable and practical guide. Principles, techniques and methods are developed in a concise manner that is logical in approach and organization. The material covered is thoroughly and effectively presented and is easily followed. For these reasons the book will be widely used in teaching and by practicing foresters. It is a fine addition to the *American Forestry Series.*

This text supersedes the 1936 edition of "Forest Mensuration," by Chapman and Demeritt. At first glance the two editions appear similar. Closer study, however, confirms that the former text is completely rewritten in almost every paragraph. It also has been rearranged in a more logical order and extended to include up-to-the-minute statistical and other techniques, particularly in the section on growth. A certain amount of outdated material has been condensed or deleted.

First, the authors present the theory and use of the cord, cubic foot, board foot, and piece for measuring cut forest products. Second, they give the principles and practices used in measurements of tree and area volumes. In these chapters they cover the field and office procedures for volume and taper table construction, followed by methods of cruising. Third there is presented up-to-date material on growth of trees and stands. Chapters 2 and 21 are devoted to useful statistical concepts, Chapter 32 deals with sample plots, and Chapter 33 has to do with forest surveys.

Chapter 6 on the theory and construction of log rules could precede Chapter 5 on scaling because many of the practices used in scaling are affected by the theory of log rules.

The section on volume tables and their construction is highly recommended. Most of the newer techniques are effectively presented, including the methods of least squares for cubic foot tables. It would have helped here, and in other places, to have had Chapter 21 on more advanced statistical technique presented earlier in the text. The discussion of board-foot volume tables includes the Girard method, the volume-diameter ratio method, and older methods such as alignment charts and harmonized curves.

The chapter on taper tables is short and weak. These tables are so useful in estimating timber quality for better economic appraisals that it is felt they should have been given more detailed consideration.

The chapters on cruising are much the same as in the former text. The fact that the authors, in this section, felt obliged not to introduce, because of space limitations, information on statistical treatment and design of sampling, quality cruising and the importance and significance of photogrammetry is understandable but hardly desirable. To some extent these subjects are treated in the excellent last chapter which cleverly pulls together the many techniques used in making forest surveys. The reviewer feels that this treatment is not sufficient in light of present day developments. The authors were cognizant of this and point out that "it is impossible in a textbook of this scope to include detailed discussion of all advanced processes" and refer the student to specialized publications. It should be pointed out that practical statistics is well integrated with subject matter in many chapters. By deleting some older material it might have been possible to include the essentials of sampling design and the elements and usefulness of photogrammetry in this section.

The section on growth is excellent. New techniques of growth determinations are included both for even and uneven-aged stands. Of particular interest is the importance placed on the application of normal yield tables in predicting growth in partially stocked even-aged stands. Also outstanding is a discussion of the silvical factors influencing growth of trees and stands. Since teachers and textbook-writers are prone to treat their special subject as a thing apart, and since current criticism of educational methods lays emphasis on this fault, it is felt that these authors are particularly deserving of praise for their integrated treatment of this subject. They continually introduce the silvical, management and economic considerations which affect mensuration practices or which, in turn, are affected by mensuration.

Helpful in understanding the subject matter is the inclusion of 69 tables, 83 figures, and many case examples taken mostly from the eastern and southern United States. The authors correctly point out that "It should be assumed not that the demonstrated techniques apply solely to the described problem but rather that they have a broad scope and are tools of more general application ready for use according to the ingenuity of the mensurationist."

Students interested in using this text should be equipped with a firm foundation in arithmetic and mathematics, but more advanced knowledge in this field will be needed only for those who wish to digest completely the more complicated concepts. The authors state that "it is not the purpose of this text to give an exhaustive treatment of arithmetical, statistical and graphical methods." They do, however, give essential basic concepts upon which more advanced students can build. The text is designed so that by proper selection of chapters it nicely meets the needs of an elementary course in mensuration. For advanced courses, practicing

foresters and research workers it is invaluable. The 595 citations to literature, which are carefully chosen and contain the latest and most important writings in each field, can augment studies in the more advanced and specialized techniques.

ERNEST WOHLETZ,
University of Idaho.

Farm Wood Crops.

By John F. Preston. 302 pp. Illus. McGraw Hill Book Co., New York. 1949. $3.75.

The idea of "integrated farm forestry," that is, the production of wood crops on the farm woven into the pattern of farm routine, is well developed and constitutes an outstanding accomplishment of this text. The author is constantly reminding the reader that successful operation of the farm woods depends to a large extent on how well it is tied into the farmer's crop schedule.

Mr. Preston approaches the problem more from the standpoint of the farm planner, technician, or other educator in an attempt first to interest, and then to gain the farmer's cooperation in carrying out a sound and permanent forestry management program. The text is, therefore, best suited to the needs of those who would engage in the work of educating in the farm forestry field.

In the twelve chapters, there are numerous illustrations, tables, and examples showing practices, results, and comparative data. Individual cases are frequently cited so that the reader may actually visualize results of various practices.

The author develops and brings down to the farm level the value of the woodland crop in the first four chapters. Beginning with the importance of wood to the world, he deals successively with the tangible and intangible values both to the nation and locality and finally to the individual farm. References to the degraded condition of the farm woodlot and the apathy of the farmer toward his woodlot might be questioned. This is not a serious error when one considers the volume of propaganda which has been released of late years on the subject.

Chapter five discusses the problems of the forester, technician, or planner, in interesting and obtaining action by the farmer in better management practices. Problems of developing a program from the farmer's standpoint are largely omitted. The author divides the task of educating the farmer into three more or less distinct levels, namely, (1) arousing interest, (2) teaching techniques, and (3) giving specialized help in marketing, supervision, etc. This is a new and logical approach and well worth commendation. His classification of farms into cash grain, dairy, subsistance, tenant-owner, etc., certainly is important in developing an integrated forestry plan for the farmer.

In the following three chapters the author enumerates and describes the activities of the various governmental agencies giving advice and rendering assistance to the farmer in developing his wood crop. The reader may well be frightened by the number and extent of the subsidies involved. Chapters seven and eight carry the process of education through the three levels.

The contents of the following three chapters, nine, ten, and eleven, should prove helpful to the educator. Various protective and silvicultural practices for coniferous and deciduous types are briefly described and well illustrated. Artificial regeneration is given an extra chapter which it hardly deserves, except for the planting of difficult sites, such as the Great Plains region. Tools needed in the farm woodlot operation are well illustrated but briefly described. It seems that the author underrates the skill necessary to use the tools successfully and to conduct the harvesting and processing operation.

The last chapter "Building a Farmer Clientel" might well have been placed forward in the text as it deals with level one in the educational process. In the appendix one may find some useful references and tables. It would appear that much could be eliminated in this section of the book without detracting from its value.

This book should prove an asset in any forester's library. It is particularly well suited to the student of general agriculture or forestry who contemplates entering the educational field or to one already engaged in this pursuit.

FRANK T. MURPHY,
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Introductory Botany.

By Alexander Nelson. 479 pp. Illus. Chronica Botanica Co., Waltham, Mass. 1949. $3.75.

It is good to escape "U. S. provincialism" occasionally and look through the eyes of a scientist across the sea. This author, at the University of Edinburgh, is obviously a scholar and also intensely interested in the most effective means of teaching. The book aims to serve a broad function, but especially to provide "a background of biological knowledge so as to colour the student's outlook and influence his thought in the future." The presentation is concise and yet complete. For instance, physiology is prefaced by a review of the necessary foundations of chemistry and physics.

The organization of the book is different, in many ways, from other current works. The sections are: I — Morphology—Anatomy—Classification, II — Gymnosperms and Non-Flowering Plants, and III — Physiology—Plant Distribution—Genetics. The classification system is the four traditional groups. Logically-minded teachers will be disturbed by the order of discussion. The plan is to treat the familiar first, *i.e.* angiosperms. One would expect to find the gymnosperms next, but it is felt that they rest on knowledge of ferns so the pteridophytes are second. Then come gymnosperms, followed by bryophytes and thallophytes. The discussion of plant groups is concluded with a short chapter on viruses.

There are a few incompletely solved problems that trouble any author. Examples: Equisetinae

"spores appear alike . . . many differ in sex potential" and, later "thalli are unisexual." Monocots are considered a natural group probably arising from primitive angiosperms. Epigyny is explained by upward growth of the receptacle.

The literal-minded may notice that wording in the table of contents does not agree with the titles of the chapters. The most striking variance is "mineral salts" as against "manurial salts." A few terms might stir argument from American readers. The chapter on gymnosperms speaks of them as "lower flowering plants." The remainder of the book uses "flower" as the sexual reproductive structure of angiosperms. On page two there is the expression "the plant *breathes* or *respires*" but the chapter on respiration is free of confusion.

Balance between the various fields of botany is good. The amount of physiology covered is rather remarkable. On the other hand, the scope of ecology has been confined too severely. The implication is made that plant geography is concerned with large areas while ecology deals with finer details, smaller units, and "minutiae of climate." Perhaps this emphasis on precision is a compliment but the dynamics of large areas over long periods is also the work of ecology.

The elaborateness of terms and very literary style probably preclude wide use of the book in the United States. Yet, it is a condensation of much valuable information, often well illustrated by the 121 excellent figures. The floral diagrams, particularly, are quite good (strong term intended, as on the Isles). These diagrams distinguish spirals from whorls, show the relation of the flower to plant axis and other details cleverly. There is an advantage in studying a fresh approach and at this low price it is hard to find an equal bargain. Advanced students and graduates preparing for comprehensive exams may find the book useful as an aid to reviewing the fundamentals of botany.

Paul C. Lemon,
N. Y. State College for Teachers, Albany.

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Manuel de l'observateur en météorologie, (The Meteorologied Observer's Handbook).

By G. Oscar Villeneuve, Bull. 12, Bureau of Meteorology, Ministry of Lands and Forests, Province of Quebec, Canada, 1949.

Under the direction and leadership of Mr. Henri Kieffer, the Forest Protection Service of the Province of Quebec has been brought to a high state of efficiency. Recognizing that in fire protection as in health services, an "ounce of prevention is worth pounds of curatives," the stress has been placed upon prevention and detection and a system of observation stations had been developed all over the Province of Quebec.

The first of these were towers connected with each other and with local district headquarters by means of two-way bush radios; the object was to provide for the detection of fires immediately after their outbreak. These stations which were originally set up in the early twenties have been kept supplied with the latest equipment and today most of them are supplied with the latest meteorological equipment. Detailed meteorological data are collected and made available for immediate use throughout the Fire Protection Services of the province.

In order to standardize the methods of collection and record field observations, Dr. Villeneuve has published this *Manuel de l'observateur en météorologie*. In doing so, he has not attempted to write a complete treatise on meteorology. There are already plenty of these available. This present manual has been prepared for the fire ranger and the ordinary layman, to make available to them for use in the forest the most up-to-date methods, describing the equipment involved and how to use it.

In the first chapter, the author points out the various uses which may be made of meteorological data mentioning the following activities: agriculture, navigation, aviation, sylviculture, health services, hydrology, fisheries, and sports. This manual is unique in that it serves all these purposes and the Quebec Forest Service is unique in that it makes available for all users of the forest all data collected and the conclusions drawn in the daily reports. The manual deals with every phase of meteorology in a general way, yet the information is complete. Without being too specialized, it aims to cover the needs of all. The pilot leaving the large industrial towns for the undeveloped northern regions of the province can get essential weather information and visibility details from stations situated between the 52nd and 53rd parallels; the skier, likewise, may get information in regard to snow conditions in any winter resort at any time, anywhere in the province.

The second chapter deals with the qualifications and requirements of station observers. Kinds of observations needed are placed into two main groups: (1) Observations made without any instrument such as observations of haze, thunder and fogs; and (2) those made with the help of instruments such as barometers and anemometers.

The manual contains a full list of the apparatus needed. Each piece is carefully described in detail with copious illustrations. Photographs taken at various stations show how the instruments are installed for use and how they are operated under actual conditions. The care and maintenance of each piece is carefully described.

In order to facilitate the work of the observer in keeping standard records, the author describes the *carnet d'opérations* (field book) and gives examples for each item to be filled in.

Dr. Villeneuve is a graduate forest engineer and licensed surveyor of the University of Laval, Faculty of Surveying and Forestry, also a Master of Science of New York State University, a Doctor of Philosophy of the Graduate School of

Forestry, Department of Meteorology, Yale University.

In the course of his studies and since graduating, he has been in contact with the most eminent Canadian and American scientists. He also has kept in touch with the latest European and American literature on this subject. His manual will be useful for all those with a knowledge of the French language who have to teach observers as well as for all the field observers of the Meteorology Service of the Province of Quebec, for whom it was specially written.

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Wood-Using Industries of New York.

By Raymond J. Hoyle and John R. Stillinger. 133 pp. Illus. Tech. Pub. No. 27 (revised), New York State College of Forestry, Syracuse, N. Y. 1949. $1.25.

Of all the states that have made surveys of industrial wood consumption, New York is the only one that has repeated them at intervals. This is a report on a 1946 census, the fourth in the series. It makes comparisons with the findings of surveys covering the years 1912, 1919, and 1926. The first two studies were made in cooperation with the U. S. Forest Service. This bulletin, like the one that reported on the 1926 survey, is the work of the New York State College of Forestry.

The bulletin gives complete details of quantities and kinds of wood used annually by individual industries in 62 tables accompanied by explanatory text. Because it includes all figures compiled by the previous surveys, it discloses information of great value to students of wood markets, particularly those who are interested in tracing recent trends.

Thirty classes of industries have a table showing the chief sizes and grades used for the principal species. There is a directory of all the wood-working establishments in the State arranged under each of the 59 classes of industries. One section of the bulletin lists all the many uses that have been reported for every species of wood in these surveys since 1912.

This is a highly competent piece of statistical work and the text is clear and concise. Those who wonder why some of the northeastern species have lost markets to lumber from other parts of the country will find answers to most of their questions in this bulletin. Those who are interested in helping northeastern woodlands regain their local markets will find guidance in it.

The 1946 list includes 59 products or classes of products like furniture and general millwork. Things listed as made with wood in 1946 but not previously are prefabricated structures, ladders, kitchen cabinets, radio and television cabinets, pallets, pencils, greenhouses, venetian blinds, flooring, excelsior, fruit and vegetable crates, butchers' supplies, hat blocks, tobacco pipes, and artificial limbs. Items in previous lists but not in the 1946 list include planing mill products, pumps and piping, shuttles, spools, bobbins, pulleys, matches, printing material, and playground equipment. Forty of the 59 general uses for wood appear in both the 1912 and 1946 lists. There have been some changes but, substantially, the uses to which wood is put remain the same.

The quantity of wood used annually in 1912 is given as 1.74 billion board feet. The 1919 figure is 1.28 billion. In 1926 it was 836 million and the 1946 figure is 655 million, 38 per cent of the quantity consumed in 1912. The 1946 figure also includes 68 million board feet of plywood and veneer. Plywood and veneer figures are not given for the earlier years.

The survey includes an estimate of the proportion of the consumption that comprises wood grown in New York State. This was 31 per cent in 1912, 15 per cent in 1919 and 1926, and 22 per cent in 1946. Furniture, the largest single consumer, got 31 per cent of its requirements from native-grown lumber in 1912 and 27 per cent in 1946. This industry used more lumber in 1946 (111 million feet) than it did in 1912 (104 million). It provides as good a market for native lumber now as it did 35 years ago. Wooden boxes took 77 million feet in 1946 against 120 million in 1912 but got only 15 per cent of their lumber supply in New York. In 1912 New York supplied 20 per cent of the box lumber. The casket and burial box industry used 18 million in 1912 and 15 million in 1946 but increased its take of New York-grown lumber from 3 to 24 per cent. The handle business used 6.5 million in 1912 and almost six million in 1946 but now gets only 70 per cent of its wood material from New York. In 1912 it got 91 per cent.

A few industries now get a larger proportion of their consumption from wood grown within the state than they did in 1912. Combined, though, the 59 industries were a market for only 144 million feet of local production in 1946, compared with 540 million in 1912. They bought 511 million feet from producers outside the state in 1946.

Quantities of a number of tropical and South American species used have increased, including the mahoganies, but the main shift, quantitatively, is toward the western species such as Douglas-fir, ponderosa pine, sugar pine, western white pine, the western cedars, and redwood. Douglas-fir increased from 1.5 million in 1912 to 66 million in 1946, from less than one-tenth of one per cent of total consumption to 10 per cent. Southern pine dropped from 262 million feet in 1912 to 90 million in 1946. But its use increased percentagewise from 11 to 14 and in 1946 it was the leading species. In 1912 it was in second place with eastern white pine the leader.

New York State's forests are close to the country's greatest markets. If the state's industries could consume nearly two billion feet of lumber in 1912, they could consume a considerably greater amount today if it were readily available in sufficient quantity and satisfactory quality. The unique proximity of these markets to for-

est areas potentially capable of supplying most of their requirements presents a more than usual challenge to the foresters of the northeast. This bulletin gives emphasis to the significance of these observations.

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Water in the Physiology of Plants.

By A. S. Crafts, H. B. Currier, and C. R. Stocking. xxi + 240 pp. Illus. Chronica Botanica Co., Waltham, Mass., or Stechert-Hafner, Inc., New York, N. Y. 1949. $6.

The average water content of plant cells sometimes reaches 85 percent, protoplasm occasionally contains as much as 90 per cent, and vacuoles have up to 98 percent water. Raw materials are taken in, transported, combined, and sometimes stored in water solution. Hence, an accurate understanding of water solutions is fundamental to any work concerning physiology of plants. The authors undertake an ambitious review of the chemistry, physics, and physiology of water relations, interpreted and tempered by their own extensive researches.

The first five chapters are mainly devoted to laying a background of physical-chemical principles upon which water movements depend. This includes the structure of water, properties of solutions, and osmosis and its mechanism. The discussion then turns to water as a plant component and the osmotic quantities of plant cells. The final three chapters treat of active water relations, movements, transpiration, and the controls affecting water loss or retention.

Although written for botanists and plant physiologists the book is not always easy reading, for many terms from physical chemistry have been used to add precision. The manuscript was apparently completed in 1947 but was unavoidably delayed. A short review appended to the preface attempts to bring the literature up through 1949. Over 700 references are discussed. Apparently, no important reference has been omitted, in consideration of the viewpoint taken by the authors. Some readers, however, might expect to find Cannon, Raber, R. B. Harvey, and perhaps others. The works of Sachs and Schimper are mentioned without indication of specific titles. The book has a detailed table of contents, subject index, and author index.

The monograph follows the Physical Methods Committee of the American Society of Plant Physiologists in urging three rather concretely defined terms for discussion of osmosis. They are: (1) osmotic pressure—*OP*, (2) diffusion pressure deficit—*DPD*, and (3) turgor pressure—*TP*. The relation of these forces to each other is: $OP = DPD + TP$. There has been some confusion of usage in cases where one of the quantities is zero (C. J. Lyon in *Science*, 1941 and H. C. Eyster in *Bot. Rev.*, 1943). In these instances one or the other of the following equations applies: $OP = DPD$ when $TP = 0$, or $OP = TP$ when $DPD = 0$.

The discussion on active water regulation is of exceptional interest though it is almost entirely based on research developments since 1935. Active control implies absorption, movement, or retention against an apparent diffusion pressure gradient. It may apply to water or solutes. The classic view, of course, was to explain water movement by osmotic forces. This has become inadequate. Active controls were mentioned in 1738 (Stephen Hales) and various vitalistic theories have been proposed since. The present authors have taken a very scientific approach throughout and finally state, p. 205, "Though the 'vital' forces involved may elude direct study, they must all be explainable eventually in terms of physical and chemical laws."

This carefully edited and finely bound book will be a useful addition to any physiologist's or physical chemist's library. It is a time-saver and is stimulating to read. It concisely covers a vast literature that is basic to designing or interpreting physiological research.

Paul C. Lemon,
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Vegetable Gums and Resins.

By F. N. Howes. 188 pp. Illus. Chronica Botanica Co., Waltham, Mass. 1949. $5.

Gums and resins have been used from remotest time for food, for chewing, for torches and other methods of illumination, to caulk boats, to preserve, waterproof or seal surfaces, and to bind materials together. Modern commerce and industry are dependent upon the efforts of countless "gum gatherers" in many parts of the world for these raw materials, most of which exude from living trees and shrubs or occur in fossil or semi-fossil form as products of plants long since dead or of species now extinct. The author pays tribute to these simple folks in his dedication.

Although many resins and some lactiferous substances are often commonly termed gums, gums and resins are quite dissimilar in their chemical and physical properties and in the purposes for which they are suited. Gums are unaffected by organic solvents but have an affinity for water, either dissolving in it to form viscous or mucilaginous liquids or absorbing it and swelling into gelatinous masses. Resins, on the other hand, are insoluble in water but dissolve to a greater or less extent in organic solvents and in various vegetable oils. They are treated separately in the two parts of this work.

The first six chapters discuss the nature and uses of gums, gum arabic and other gums derived from species of Acacia, gum tragacanth from thorny shrubby astragali and similar gums, including karaya, carob seed, and kutira from other plant sources, more than 20 well-recognized Asiatic gums, many little known, mainly Old World gums from 67 different plant genera, and gums from South, Central, and

North America, only a few of which have achieved much commercial importance.

The second part, of 11 chapters, discusses the properties and uses of resins in general and various kinds, including copals and kauri (mostly fossil or semi-fossil resins), dammars, rosin, lac resin (not a natural plant exudation but produced by the lac insect from the various plants on which it feeds), some varnish resins much esteemed in the past, elemi types (mixtures of resins and essential oils), natural lacquers used in making the famous lacquerware of China and Japan and that of Burma, the fragrant frankincense and myrrh of Biblical reference, and a variety of medicinal and other resins from plants of some 33 genera.

The dendrologist and botanist should find the presentation to their liking, the main emphasis being on the trees or shrubs—their botanical identity, how they look, their habitat and geographical distribution, the kind of exudation and how it is collected, sorted and marketed, together with fascinating information on native uses, historical items, exporting and importing towns and countries, and market prices. There are just enough data as to chemical and physical properties and application in industry and the arts for comprehension of the non-technological reader, with references to the many technical works that may be consulted for detailed analyses and utilization procedures.

Special effort has been made, as stated in the preface, to bring out recent trends, such as the increased demand for certain natural resins which combine with synthetic resins to form new resin types, and to include the "newer" gums and resins that are finding special industrial applications. It is therefore surprising and disappointing that the discussion of one of the most important industries in the United States—the production of naval stores—falls short by a decade or more of being up to date. For example, the stimulation of the face of turpentine pines with acid for increased and prolonged yields is mentioned only in connection with an experimental project in Germany (about 1936) using hydrochloric acid. The reader would not learn that the United States is long past the experimental stage and employs chemical stimulation in actual practice, using, however, sulfuric rather than hydrochloric acid. Nor would he be apprised of the tremendous developments in this country in obtaining rosin from other sources such as stump wood and wood pulp processing, with its attendant production of the increasingly valuable tall oil. Further, slash pine is now more important than longleaf pine as a yielder of naval stores, and Georgia, not Florida, leads in the production of gum naval stores.

It is a great satisfaction to read a book dealing with plant products in which the scientific names of the plants are accurately given. However, such scholariness is exactly what would be expected from the pen of this author who is curator of the Museum of Economic Botany of the Royal Botanic Gardens at Kew, England, and also a member of the Imperial Institute Consultative Committee on Gums and Resins and well known for his many publications on economic plants. The authorities for the plant names are purposely omitted in the text but listed in the index of botanical names, including 525 valid and synonymous specific names, and a number of varietal, generic and family names. There are also an index of common names and a bibliography of 177 titles.

The illustrations include flowering or fruiting leafy branches, flowers, fruits, and seeds of 37 species, two outline maps showing world distribution of the more important gums and resins, quaint woodcuts of the type so characteristic of this publishing house, and seven attractive vignettes, mainly stylized flowers and leaves of selected gum or resin plants of antiquity.

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Missouri River Basin Agricultural Program.

House Document No. 373, 81st Congress, 1st Session. October 5, 1949. 193 pp. illus. U. S. Govt. Printing Office. (A report by the Secretary of Agriculture, April 1949. Revised August 1949.)

This is a unified and extremely broad 30-year land program for the Missouri Basin designed to complement, support, and balance extensive projects for main-stream flood control, irrigation, navigation, and water power now being proposed and instituted by other agencies, particularly under the Pick-Sloan plan.

Foresters will be interested in the report not only for the prominent part forestry measures play in it but for the soul-stirring breadth and magnitude of the conservation program.

Essentially, the report clarifies and integrates the many diverse authorizations and programs the Department of Agriculture now has in the area and recommends acceleration of the program as a whole. Little is new in the way of lines of work proposed or authorization required. The program is timed to accomplish in 30 years what might otherwise take perhaps 100 years. The report characterizes itself "a new and outstanding landmark in planning for the continuous development, conservation and use of our assets in land, water and forests."

The program is BIG. An idea of the magnitude of the program is given by the following:

Total cost is estimated at $8,487,057,000 affecting 340,000,000 acres or $25 per gross acre. Another over-all comparison is that in 1945 the total farm valuation of the basin (land, improvements, livestock and implements) was $9,100,000,000. Still another: the total population in the basin, rural and urban, was 6,985,698 in 1940. The agricultural program, therefore, contemplates an investment of $1,215 for everyone in the basin or $3,275 per capita for the farm population of 2,591,552.

It is estimated that the total cost would be distributed 36 percent federal, 5 percent state and local

government and 59 percent landowners and operators. In the main, the Department would continue and expand its present programs which are largely handled on a cooperative basis with farmers.

The program would go forward on five major operating fronts:

1. Conservation and improvement measures on grassland and cropland; 2. Forests and forest ranges; 3. Stabilizing measures for small water courses; 4. Irrigation (Information and assistance to farmers. Does not include cost of major irrigation installations which are handled by the Bureau of Reclamation.); and 5. Drainage of agricultural lands.

The report also includes recommendations for an accelerated program of research and extension education and for improved credit facilities.

The strategic and important position of forest and range land in the resources and economy of the valley is given large recognition. It is pointed out, for example, that more than one-third of all the water potentially available for irrigation comes from the national forest areas in the western part of the basin.

A $999,561,000 forest and range program is recommended: 46 percent federal and 54 percent privately financed. Major items in the program are:

Forest planting. Plant 2.8 million acres, interplant an additional 2.2 million acres. Successful plantings to date under 1 million acres.

Shelterbelt and other protective plantings. Two hundred and forty-five thousand additional miles of shelterbelts and 750,000 additional acres of windbreaks. Present shelterbelt and windbreak plantings total 96,168 miles.

Nurseries. Build up capacity to 250 million annually. Present capacity available about 20 million.

Timber stand improvement. Two million six hundred thousand acres of release cuttings or other work in plantations, 1 million acres of forest pruning, and 4 million acres of weeding, thinning, and other stand improvement.

Range lands. Reseeding on 400,000 acres, extensive fence and other stock-handling facilities, 5,600 stock-watering facilities and nearly 1,300 miles of stock driveways.

Administrative improvements. Twenty-five thousand miles of additions to and improvements of national forest roads, 1,385 airplane and helicopter landing fields, 4,200 miles of telephone line, 900 radio units, and various barracks and other structures.

Recreation. A greatly enlarged program including camp and picnic developments, winter sports areas, sanitation and water systems, and structures.

Other. Extensive insect, disease, weed, and predator control projects.

The scope of the report is too great to comment upon specifically though a few general points might be mentioned. It has been questioned whether it is possible within our democratic form of government to achieve the leadership and coordination necessary to maintain our renewable natural resources in perpetuity. This report gives heartening evidence that we have agencies of government with the vision and perspective not only to see large situations but able to devise a comprehensive action program within our form of government. The large responsibility of the people in the Missouri Basin and the close public-private cooperation necessary to carry out the program are featured.

Along with this, however, comes the inevitable question of where to stop. While the principle is recognized that benefits must at least equal costs, the department does not feature mechanics and procedures to insure that all parts of the program receive careful scrutiny from this standpoint. It took the position that the desirability of the programs was so well established in national policy that it was not worthwhile to estimate specific cost-benefit relationships in the report. In fact, it is strongly implied that there is no question on this score. Perhaps so, but the taxpayer might like to be reassured on this point as he is called upon to pay for many programs each desirable enough in purpose but adding up to a staggering total.

It should also be recognized that Agriculture proposes only a part of the total Missouri Valley program. The extensive flood control, irrigation, and power projects included in the Pick-Sloane plan and land management projects on 40,000,000 acres of public lands under jurisdiction of the Department of the Interior are not included. There are other government projects in the area also.

All in all, the report is of a scope and spirit to stir the imagination of anyone interested in facing up to the real magnitude of our conservation problem. Protection of the resource is combined with its use and both directed toward total betterment of the region.

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Fieldbook of Natural History.

By E. Laurence Palmer. 664 pp. Illus. McGraw-Hill Book Co., New York. 1949. $7 (Textbook edition, $5).

This book is a very useful comprehensive reference covering the whole field of natural history. Sections of it are devoted to the solar system, the minerals, the plant kingdom, and the animal kingdom. While the book is in the nature of an encyclopedia, space limitations prevent it from being entirely complete. However, Dr. Palmer's broad experience in teaching natural history to many widely varying groups has made him well qualified to select his subjects. His experience in lecturing for undergraduates, elementary school groups, farmers, and scientists has helped him to determine the forms he would describe.

Specialists in any one of the fields of natural history may be critical of the omissions. This reviewer agrees with the author that the things which will interest most people are well covered. Comparison of the treatment of any one form in this book with that in one limited to the science of that form will substantiate this.

There is a wealth of good charts, photographs, and line drawings to illustrate each subject. In addition to the illustrations, the text contains sufficient material for identification. Data on range ecology, life history, and economic importance are included. Insofar as possible, the treatment of each form is uniform. The subjects are treated in their taxonomic order—the simplest forms first, the more complex later.

Simple language has been used, rather than technical terms, as far as possible. The book is an excellent reference. It is indispensable in a limited library. This reviewer recommends it for foresters, wildlife biologists, teachers, parents, and anyone interested in any phase of natural history.

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Memoir of The XXI Congress of the State Council for the Protection of Nature in Poland.

By the Ministries of Forestry, Education, and Public Administration. Krakow, Poland. 170 pp. 1948.

In the ravaged country of Poland, some 300 persons representing scientific, tourist, hunting, fishing, governmental, and other institutions, met October 2-5, 1947, to discuss the general protection of nature which includes the forests, waters, soils, plant and wildlife.

The conference was held in the Bialowieza Forest, which is the oldest best-preserved Polish National Park representing the unique "lowland primeval forests" in Europe. The "Memoir" of the conference, published in Polish and briefly summarized in English, records the radical change which has taken place in Poland. Because of this change, expert scientific workers are being trained in the field of nature protection to administer the country's 488 nature reservations, of which 226 are classified as "forest." The remainder cover steppes, water, peat-bog, rare plants, rare animals, and inanimate nature.

Forest management in Poland is based upon the study of natural science as a generally conceived form of nature protection. At the present time Polish foresters are concerned with inventorying their state forests to determine the permissable amount of cuttings, extent of afforestation, and proper systems of management. Control has been partly gained over the hitherto raging pillage of state forests, and poaching. A "Forest and Nature Protection Day" has been proclaimed and organized throughout the country.

More than 90,000,000 zloty were designated for combatting the elementary disasters which covered an area of 250,000 hectares, and 3,190,000 zloty has been appropriated for safeguarding various nature objects.

The booklet discusses research involved in the regeneration of the forest tarpon, which is the Polish primative horse (Konik), in the Bialowieza Forest. It describes the fate that befell the Bialowieza Forest during the war when German zoologists and foresters carried off to Germany 33 of the most valuable Koniks, the return of which Polish foresters have been endeavoring to achieve for more than two years through the Polish Government and the Allied military authorities in Germany. It also discusses the bio-ecological studies of bison as carried out by the Research Institute of State Forests and tells how the bison has been restored to the Bialowieza Forest after having been utterly exterminated by the Germans during World War I.

Serious thought is being given the study of water resources management in Poland. The matter of protecting water supplies for the increasing demands of household needs, industry, farms, timber production establishments, inland navigation, and hydroelectric plants, is of great concern. Water supply in rivers and streams is subject to greater oscillations than is the water demand. Polish foresters say that reforestation of the upper parts of drainage basins would bring about a favorable change, that present day populations and cultivation probably render impossible such afforestation as would bring full results by equalization of the overflow, and that deforestation which has been carried out for the purpose of obtaining agricultural land has deprived river basins of their natural outflow-equalization. The problem of landscape conservation in road construction is also mentioned, including the importance of stabilizing roadsides with proper vegetation. In all nature protection projects, the aim is to harmonize the landscape features of the country.

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An Investigation of the Influence of Reforestation on Stream-flow in State Forests in Central New York.

Prepared by Gordon R. Ayer. 185 pp. Illus. Geological Survey, U. S. Dept. of the Interior. Albany, N. Y. 1949.

Research begins by studying the known to determine the unknown; it concludes by reducing the unknown to the known. Any other beginning will yield instead of new knowledge, a verification of old. The report reviewed is merely an example of the latter.

This publication reports the progress of an investigation to determine the effect of reforestation on streamflow. Armed with statistical analyses of 14 years of data, the author presents convincing evidence that this effect has been insignificant. In light of the vegetation and soil of the experimental areas this conclusion was to be expected, so much so that it is surprising that for the area concerned the study was deemed necessary.

Three drainage areas in south central New York, partially reforested in 1932-1933, were selected for testing against check areas which had not been planted. Both treated and controlled areas possessed, in words of the author, "satisfactory initial cover of shrubs, grass, weeds, and scrub brush." This cover so protected the

topsoil that erosion was not a problem.

The author expected, and rightly, that under these conditions the effect on streamflow of planting these vegetated drainages would be slight and difficult to determine. This supposition was supported by the fact that only 60, 55, and 30 percent of the three drainages were planted. (Unaccountably, the author failed to name the species used.) Change in streamflow was expected to depend on the magnitude of the changes in evaporation, transpiration, interception, and infiltration that occurred following planting.

Familiarity with the nature of these processes in relation to conditions in the area would have terminated this study before its inception. It would have been realized, for instance, that a partial substitution of one type of cover for another would not change evaporation to any extent. Too, the fact that erosion was of no consequence should have indicated that infiltration was not a limiting factor.

Change in transpiration due to reforestation depends on changes that occur either in amount or depth of root penetration. As the watersheds studied possessed hydrologically shallow soils, often two feet or less in depth, no real change in rooting or transpiration could be expected. Vegetation fully covered these areas before planting, and undoubtedly the root systems of the trees, shrubs, and grasses penetrated to the full depth of these soils and fully utilized the available moisture. A change in species, as by planting, could not constitute an additional drain on the soil moisture over and above that already present. Further, the limited depth of these soils disallowed any deeper root penetration into untapped sources of moisture. The result is that by reforestation of these areas, transpiration would not change much, if at all; certainly not enough to be capable of measurement at a stream gage.

Nor is it expected that rainfall interception would greatly change. Available data indicate that the quantities of water lost by interception annually either by trees, shrubs, or minor vegetation may not differ materially. Snow interception would be a different matter. Its magnitude would depend on the areal extent of the stands, the species planted, and the proportion of precipitation which falls as snow. The author recognizes that as the canopy of the plantation has not closed, this factor is not yet fully operative. Again, data are available from which the magnitude of this factor can be estimated. If it is believed important, there are certainly more efficient means of measuring its effect than continuous stream gaging while waiting for the canopy to close.

After establishing the inevitable, the author recommends that this experiment be continued for another ten years under the assumption that given enough time a significant change in streamflow can be demonstrated. This recommendation should be given more consideration than that which was given to the original need for this investigation.

Perhaps the principal lesson to be learned from this study is that it well illustrates the wisdom of thoroughly analyzing the problem before active work is begun, and of further analysis whenever changes in procedure are contemplated. In such a complex field of research as forest hydrology, group consideration by specialists in such fields as soils, hydrology, forest management, ecology, and biometry would prevent undertaking unfruitful lines of study. Such a group, meeting to study the experimental area and discuss the need, objective and design of a study, or to review its past accomplishment and plan for future work would help assure effective research.

Finally, while this review is critical in the strongest sense of the word, it is not meant to disparage the objective of the study or the laborious and painstaking work which has gone into the study and the preparation of the report. Certainly there is a real need for investigations of this kind. But because of this very need, and because these studies require large expenditures of time, money, and labor, they should be so located and so well thought out as to produce worth-while results. The only guarantee for this is an impartial and searching analysis of these studies before they are initiated.

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Compiled by MARTHA MEELIG, *Librarian*
The New York State College of Forestry

Range Management Section Compiled by
FRANCES FLICK, *Library, U. S. Department of Agriculture*

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Wood Preservation

Determinacion del Grado de Penetrabilidad en Maderas Argentinas. By J. C. Tinto. 19 pp. Illus. Ministerio de Agricultura y Ganaderia, Buenos Aires, Argentina. 1949. Pub. Tech. No. 12.

Wood Fire Doors. Illus. Fox Bros. Manufacturing Co., St. Louis 4. 1949. Free.

Wood Technology and Utilization

The Anatomy of Timbers of the Southwest Pacific Area. 1. Anacardiaceae. By G. E. Dadswell and H. D. Ingle. pp. 391-415. Illus. Australia Council for Sci. and Indus. Research. Div. of Forest Products. Reprint No. 109 from Australian Jour. of Sci. Res. Vol. 1, No. 4. 1948.

Forest Utilization in the Transitional Stage. By G. A. Garratt. 28 pp. Duke Univ. School of Forestry, Durham, N. C. 1949. Lectures No. 8.

Holztechnologisches Handbuch. Vol. 1. By Leopold Vorreiter. Illus. Georg Fromme et Co., Vienna. 1949.

Indicaciones Sobre la Tala de Arboles y Estacionamiento de Maderas. By J. M. Garcia and J. C. Tinto. 13 pp. Illus. Ministerio de Agricultura y Ganaderia, Buenos Aires, Argentina. 1949. Pub. Misc. No. 318.

Legno e Legnami Indigeni ed Esotici Difetti. Cause. Rimedi. By R. Cormio. 520 pp. Illus. Inst. Experimental du Bois, Milan, Italy. 1949.

Ponderosa Pine, Its Properties, Uses and Grades, rev. ed. 72 pp. Illus. Western Pine Assoc., Yeon Bldg., Portland 4, Ore. 1949.

A Simple Method of Curing Resin Adhesives. By D. Narayanamurti and V. Ranganathan. 3 pp. Illus. Forest Res. Inst., Dehra Dun, India. 1948. As. 4 or 5d.

The Swelling of Wood Under Stress; A Discussion of its Hygroscopic, Elastic and Plastic Properties, Based on a Course of Lectures Given at Svenska Träforskningsinstitutet, Stockholm, Sweden, March, 1948, by W. W. Barkas. 103 pp. Illus. H. M. Sta. Off., London. 1949. 6s.

Society Affairs

Compiled by ROBERT D. HOSTETTER, *Assistant Executive Secretary*

Officers and Members of the Council—1950-1951

CHARLES F. EVANS, *President*
U. S. Forest Service,
Glenn Building,
Atlanta 3, Ga.

FREDERICK H. BRUNDAGE,
3290 N. E. Irving Street,
Portland 12, Ore.

D. B. DEMERITT,
Dead River Company,
6 State Street,
Bangor, Me.

STANLEY G. FONTANNA,
State Department of Conservation,
Lansing 13, Mich.

CLARENCE S. HERR, *Vice President*
Woods Department,
Brown Company,
Berlin, N. H.

FRANK H. KAUFERT,
School of Forestry,
University of Minnesota,
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C. OTTO LINDH,
U. S. Forest Service,
Post Office Building,
Albuquerque, N. M.

GORDON D. MARCKWORTH,
College of Forestry,
University of Washington,
Seattle 4, Wash.

HENRY CLEPPER, *Executive Secretary*
825 Mills Building,
17th Street at Pennsylvania Avenue, N. W.
Washington 6, D. C.

RICHARD E. MCARDLE,
Forest Service,
U. S. Department of Agriculture,
Washington 25, D. C.

DEWITT NELSON,
Division of Forestry,
Department of Natural Resources,
Sacramento 14, Calif.

EARL PORTER,
Southern Kraft Division,
International Paper Company,
Mobile 9, Ala.

Section Manuals Distributed

Based on the recommendations of Section officers and marking the culmination of several years of work by the Society staff, Section Manuals were distributed in February to Section, Chapter, and Society officials. Copies have gone to the chairman, vice chairman, secretary-treasurer, and membership chairman of each Section, to the chairmen of recognized chapters, and to all Council members.

The Manual is divided into ten major parts. These are devoted to Society objectives, organization, duties of Section officers, meetings, rules of order, Section activities, membership, publications, code of ethics, and the constitution.

The use of new, simplified membership forms recently devised by the Council Committee on Admissions is explained in the Manual. Answers to common questions relative to membership procedures are given, also.

Lists of all Society presidents and Fellows are also provided, as are membership statistics for the past ten years and other data not readily available elsewhere.

Of primary interest to those charged with the effective operation of Sections and Chapters are the recommendations of former officers on the conduct of meetings and on means of stimulating interest in the activities of the Society.

The Section Manual is of loose-leaf construction, permitting periodic revision. It is expected that it will become a "clearing house" for the exchange of good ideas between Sections.

Outgoing officers will give their copies of the Manual to their successors.

Council Coordinates Boundary Descriptions

Executive committees of the twenty-one Sections are currently engaged in appraisals of the accuracy with which their Sections' territories are described in the bylaws of their Sections.

Sections situated adjacent to the Canadian border are also giving thought to how S.A.F. members in Canada can best be assigned for participation in Section activities.

According to present Section bylaws, conflicts sometimes exist where two or more Sections may claim the same area.

Section secretaries will notify the Society office during March or April if the executive committees of their Sections wish to recommend changes in Section territories as recently proposed by the Society office.

Recommended improvements in Section territory descriptions will be coordinated by the Council, and when all conflicts are removed, will recommend the accepted descriptions to the Sections for inclusion in their by-laws.

When the boundary coordination project is completed, a revised map of the Sections will be published.

New S.A.F. Emblems Now Available

In addition to the regular pins worn by all grades of Society members (except Affiliate), newly-designed tie chains with emblem pendants have been secured by the Society to meet the requests of many members.

The pendants are the same shape and size (⅝ inch wide) as the pins, with 10K solid gold border and lettering on a glossy, dark green background. The tie chains harmonize with the pendants and can be adjusted easily to fit ties of any width.

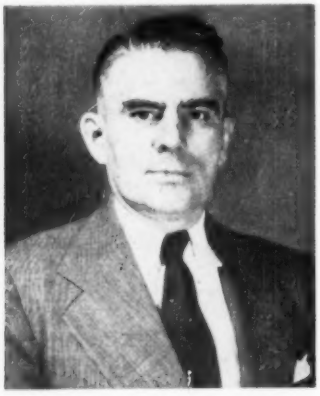
At the present time, orders for tie chains and pendants can be accepted only from Members and Fellows. Direct your requests for emblems to: Society of American Foresters, 825 Mills Building, Washington 6, D. C. The price for a tie chain and emblem pendant is $6.00 complete, with 20 percent federal tax already included.

New Service Added

The issuance of "Communiques to Sections" was begun in January by the Society office as a new service to Section and Chapter officials. The communiques will aid them in keeping informed on current Society plans and policies. They also afford a means of presenting important matters to the Sections for their consideration and recommendations.

Kentucky-Tennessee Plans Junior Award

According to J. O. Artman, chairman of the Kentucky-Tennessee Section, Junior Members in that Section are now eligible for an annual cash award in technical writing. This year's Junior Member Award Committee, composed of Richard Kilbourne



Richard Kilbourne, chairman of Projects Committee in Kentucky-Tennessee Section.

(chairman), C. I. Peterson, and Harry Nadler, is now at work formulating rules and regulations to govern the award. As originally proposed, the award will go each year to the Junior Member submitting the best case report on some phase of his work. Winning papers will be read at the annual winter meeting of the Section and submitted to the JOURNAL for publication.

A Journalism Award Committee will also be set up this year to provide suitable recognition for rural newspaper editors who do outstanding work in forestry journalism. The award, to be presented annually, will probably be in the form of a scroll or plaque. Mr. Artman suggests that other Sections might wish to cooperate in similar projects, each Section choosing a winner from those given recognition.

Central States Group Coordinates Chapters

A report of the Central States Section's Committee on Providing More Service to Members by the Section, headed by Luther Schnur, was a feature of the Section meeting on October 27, 28, and 29, 1949 at Cairo, Illinois.

The committee made the following recommendations:

1. Publication of at least two newsletters, with Chapter reporters collecting news items.
2. Executive committee to meet with Chapter chairmen once a year; and consideration of the proposal that Chapter chairmen be made members of the executive committee.
3. Section to keep Chapters informed on Section affairs.
4. Recognition of Illinois Technical Forestry Association as a Chapter.
5. Executive Committee should consider devoting part of annual fall Section meeting to presentation of technical papers or Section should hold two meetings each year instead of one as at present.

Leonard Schwartz, director, Illinois Department of Conservation, addressed the group on the conservation program of Illinois on October 27. The following evening Robert Lansden, a Cairo attorney, gave a talk concerning the Horseshoe Lake Goose Refuge.

On October 28 wood-using industries in Cairo were visited. These included the Louisiana Lumber Company, J. L. Bruce and Company, and the Illinois Manufacturing Company.

New officers of the Section are Roy Brundage, chairman; Warren Chase, vice chairman; and Charles S. Walters, secretary-treasurer.

J. Lee Deen Describes European Schools

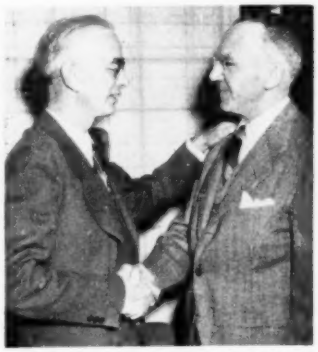
At a meeting of the Central Rocky Mountain Section in Denver, Colo., on November 3, Chairman J. Lee Deen gave his impressions of the European forestry schools which he visited during the summer of 1949. He considered the stiff entrance examinations of the European schools desirable. Likewise, he thought their practice of not giving credit for sub-college courses was a good one. In general, however, he was of the opinion that forestry schools in the United States were superior to those in Europe.

E. G. Dunford, who was elected secretary-treasurer at the meeting, is inaugurating the publication of a Central Rocky Mountain Section Newsletter, following the recommendation of Section representatives at their joint meeting with the Council in Seattle.

Warren Tracy was appointed chairman of the membership committee.

New York Section Installs Officers

Albert J. Woodford, District Forester, New York State Conservation Department, was elected chairman of the New York Section at its annual winter meeting held in Albany on December 9 and 10. Woodford succeeds



Albany Times Union

Thomas F. Luther, right, congratulates his successor, Albert L. Woodford, as chairman of the New York Section.

Thomas F. Luther whose two-year term saw the formation of local chapters of the Section. Other officers elected are Fred E. Winch, Jr., vice chairman, and Abraham George, Jr., member of the executive committee. Winch is assistant extension forester at the New York State College of Agriculture and George is assistant district forester in District 4, New York State Conservation Department, Bath, New York.

Dr. Hardy L. Shirley was the principal speaker at the evening banquet. He gave an illustrated talk on the Third World Forestry Congress held at Helsinki, Finland, last summer. Dr. Shirley was a U. S. Delegate to this Congress. Fred McLane, chief airplane pilot for the N. Y. State Conservation Department, presided as toastmaster. Motion pictures of the past four Section summer meetings by W. M. Harlow completed the enjoyable dinner program, according to the report of Ralph G. Unger.

The major portion of the program was given to papers and discussion of the various aspects of growing red pine in New York State. This species has proved to be one of the most successful trees used over a period of forty years of reforesting idle land in New York.

Papers and discussion included such features as site choice, insect enemies, growth and yield, and control of stand density.

Forest Forum Meets

Daniel Gillerman reports that Inners Herrela discussed inventory methods used by the Shasta Forests Company at the January meeting of the Sacramento Forest Forum. Shafco of Redding, Calif. manages 700,000 acres of land in Shasta and Tehama counties, selling standing timber, grazing rights, and recreational leases, but does not operate a mill.

The Sacramento Forest Forum is a chapter of the northern California Section of the Society. Officers elected at the meeting were: Myron Wall, chairman; Tobe Arvola, vice chairman; and Jack Larson, secretary.

Candidates for Membership

The following names of candidates for membership are referred to the membership for comment or protest. The list includes all nominations received since the publication of the February JOURNAL without question as to eligibility. Names, addresses, education, and endorsements are given. The names have not been passed upon by the Council. Important information regarding the qualifications on any candidate which will enable the Council to take final action with a knowledge of essential facts should be submitted before April, 15, 1950. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered as strictly confidential.

Allegheny

Junior Membership

Warsham, J. N., Agric. Instructor, Garrett County School Board, Grantsville, Md.; V. P. I., B.S., 1941; Duke, M.F., 1949. J. A. Beal, E. S. Harrar, C. F. Korstian.

Appalachian

Junior Membership

Altman, J. A., County Forester, N. C. Dept. of Cons. & Development, Elon College, N. C.; N. C. State, B.S.F., 1949. C. M. Kaufman, J. V. Hofmann, W. D. Miller.

Avery, T. E., Grad. Forestry Student, Duke Univ., Durham, N. C.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Broadway, C. A., Asst. Forester, S. C. State Comm. of Forestry, Columbia, S. C.; N. C. State, B.S.F., 1949. C. M. Kaufman, G. K. Slocum, R. J. Preston, Jr.

Dunn, R. L., Sr. Forester, Va. Forest Service, Charlottesville, Va.; Pa. State, B.S.F., 1948. T. R. Elliott, S. G. Hobart, W. F. Custard.

East, J. W., Asst. Ext. Forester, V. P. I., Blacksburg, Va.; V. P. I., B.S.F., 1943; Duke, M.F., 1949. J. W. O'Byrne, F. W. Patton, C. E. Gill.

Hofmann, J. G., Forest Engr., Halifax Paper Co., Roanoke Rapids, N. C.; N. C. State, B.S.F., 1942; M.S.F., 1947; Duke, D. F., 1949. C. M. Kaufman, L. Wyman, R. W. Graeber.

Jones, E. T., Farm Forester, Agr. Ext. Service, Goldsboro, N. C.; N. C. State, B.S.F., 1949. C. M. Kaufman, R. M. Carter, R. J. Preston, Jr.

Lyon, E. L., Service Forester, Va. Forest Service, Charlottesville, Va.; N. Y. State, B.S.F., 1939; M.S.F., 1940. F. M. Straight, S. G. Hobart, W. F. Custard.

Weatherly, J. H., Box 435, McColl, S. C.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Wyckoff, P. J., Grad. Student, Duke Univ. Durham, N. C.; Mich. State, B.S.F., 1949; Duke, M.F., 1950. A. M. Sowder, A. E. Wackerman, R. B. Thomson.

Central Rocky Mountain

Junior Membership

Bean, P. W., Inspector, Commercial Testing Labs., Denver, Colo.; Colo. A & M, B.S.F., 1949. J. L. Deen, W. Schaeffer, J. V. Wagar.

Grater, W. C., 1628 S. Clarkson, Denver, Colo.; Mont. State, B.S.F., 1949. F. G. Clark, M. S. Morris, C. W. Waters.

Green, D. A., Prod. & Shipping, Western Wood Pres., Inc., Denver, Colo.; Colo. A. & M., B.S.F., 1948; M.F., 1949. J. L. Deen, W. Schaeffer, J. V. K. Wagar.

Kitchens, J. H., 407 Smith St., Sheridan, Wyo.; Mont. State, B.S.F., 1949. F. G. Clark, C. W. Waters, R. Williams.

Mitchell, W. J., Woods Supt., Western Wood Pres., Inc., Walden, Colo. A & M, B.S.F., 1947. J. L. Deen, W. Schaeffer, J. V. K. Wagar.

Central States

Junior Membership

Greer, J. K., Mgr. Spickelmier Co., Indianapolis, Ind.; Purdue, B.S.F., 1949. R. C. Brundage, E. W. Stark, C. S. Miller.

Schoder, T. H., 59 Iroquois Ave., Battle Creek, Mich.; Mich. State, B.S.F., 1949. Karl Dressel, P. W. Robbins, R. J. Panshin.

Columbia River

Junior Membership

Coulter, W. K., Ento., Forest Insect Lab., Portland, Ore.; Univ. of Wash., B.S.F., 1948. J. M. Whiteside, R. C. Wilson, F. L. Moravets.

Henriksen, J. C., Asst. Forester, Alexander Yawkey Lbr. Co., Prineville, Ore.; Univ. of Wash., B.S.F., 1949. G. D. Marckworth, B. L. Grondal, J. C. H. Robertson.

Hughes, W. G., Tech. Asst., Oregon State Board of Forestry, Roseburg, Ore.; Oregon State, B.S.F., 1949. G. H. Barnes, R. F. Keninston, W. F. McCulloch.

Peters, D. L., Dist. Forest Rgr., Fremont Natl. Forest, Lakeview, Ore.; Wash. State, B.S., (Agric.), 1939. Columbia River.

Wheeler, W. P., Instructor, Oregon State College, Corvallis, Ore.; Univ. of Minn., B.S.F., 1948; M.F., 1949. Bruce Starker, R. F. Keniston, W. F. McCulloch.

Gulf States

Junior Membership

Adkins, V. C., Route No. 2, Minden, La.; La. State, B.S.F., 1950. R. W. Hayes, B. A. Bateman, A. B. Crow.

Holcombe, E. D., Soil Cons., U.S.S.C., Alexandria, La.; La. State, B.S.F., 1949. A. B. Crow, M. B. Applequist, R. W. Hayes.

Hughes, J. D., Jr., Asst. Dist. Forester, Gaylord Cont. Corp., Bogalusa, La.; La. State, B.S.F., 1949. R. J. Freshwater, J. H. Kitchens, Jr., R. T. Wall.

Inland Empire

Associate Membership

Bullock, E. R., Public Relations Director, Potlatch Forests, Inc., Lewiston, Idaho; Univ. of Idaho, B.A., (Journalism), 1937. Inland Empire.

Intermountain

Junior Membership

Johnson, C. J., Utah Const. Co., Grace, Idaho; Mont. State, B.S.F., 1949. F. G. Clark, P. E. Bruns, M. S. Morris.

Hirsch, E. C., Forester, U.S.F.S., Vernal, Utah; Colo. A & M, B.S.F., 1947. J. L. Deen, W. Schaeffer, J. V. K. Wagar.

Miller, P. S., Forester, Asst. Dist. Rgr., Medicine Bow Natl. Forest, Laramie, Wyo.; Univ. of Mich., B.S.F., 1949. D. Nordwall, R. V. Adolphson, N. A. Avery.

Kentucky-Tennessee

Junior Membership

Connelly, J. F., Farm Forester, Tennessee Forest Service, Lewisburg, Tenn.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, B. N. Bishop.

Haskins, E. B., Route 2, Lewisburg, Tenn.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Johnson, A. W., Park Ranger, Natl. Park Service, Mammoth Cave, Ky.; Iowa State, B.S.F., 1948. A. McComb, G. W. Thomson, G. B. Hartman.

Mauer, B. H., Farm Forester, Ky. Div. of Forestry, Frankfort, Ky.; N. Y. State, B.S.F., 1949. H. Nadler, G. E. Nietzold, H. Sipe.

Thigpen, V. G., 306 E. Frunce Lane, Oak Ridge, Tenn.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Woods, F. W., Student Assistant, Botany Dept., Univ. of Tenn.; N. C. State, B.S.F., 1949. C. M. Kaufman, L. Wyman, G. K. Slocum.

New England

Junior Membership

Brigham, L. H., Resident Forester, N. E. Forestry Foundation, Boston, Mass.; Univ. of Vermont, B.S. (Agric.), 1947; Duke, M.F., 1949. J. A. Beal, E. S. Harrar, C. F. Korstian.

New York

Associate Membership

Perry, H. J., Editor, Paper Trade Journal, New York, N. Y. New York.

Northern California

Junior Membership

Bradshaw, R. I., Office Mgr., Wolf Creek Tbr. Co., Rockport, Calif.; Univ. of Calif., B.S.F., 1948. F. S. Baker, J. Kittredge, R. A. Rockwell.

Evans, G. G., Asst. Logging Supt., Hammond Lbr., Sonora, Calif.; Univ. of Calif., B.S.F., 1933. Reinstatement.

Herrala, I. E., Inspt., Shasta Forests Co., Redding, Calif.; Wash. State, B.S.F., 1938. Reinstatement.

Rappleye, R. E., Cartographic Aide, Geological Survey, Sacramento, Calif.; N. Y. State, B.S.F., 1949. D. Nelson, R. Burns, P. Cox.

Northern Rocky Mountain

Junior Membership

Bauman, R. H., Range Cons., Bur. of Land Mgmt., Billings, Mont.; Mont. State, B.S.F., 1949. R. Williams, F. G. Clark, C. W. Waters.

Fernette, W., Student, Mont. State, Missoula, Mont.; Mont. State, B.S.F., 1949. P. E. Burns, T. A. Walbridge, Jr., T. C. Spaulding.

Levin, O. R., Mgr. Forester, S. Olympic Tree Farm Co., Shelton, Wash.; Univ. of Mont., (3 yrs.). Northern Rocky Mountain.

Ozark

Junior Membership

Ashley, B. S., Farm Forester, Mo. Cons. Comm., Jefferson City, Mo.; Mich. State, B.S.F., 1949. W. E. Towell, G. O. White, R. H. Degler.

Puget Sound

Associate Membership

Stevens, J. F., Public Relations Counsel, W. C. Lbrn's Assoc., Seattle, Wash., Puget Sound.

Junior Membership

Baris, D. M., Forester, Taholah Indian Agency, Hoquiam, Wash.; N. Y. State, B.S.F., 1948. V. M. Bousquet, W. A. Tinney, D. R. Hopkins.

Bennett, T. M., Dist. Forester, Div. of Forestry, Fairbanks, Alaska. Puget Sound.

Clough, J. H., Forester, U.S.F.S., Cordova, Alaska; Colo. A & M, B.S.F., 1947. J. L. Deen, W. Schaeffer, J. V. K. Wagar.

Morgan, R. G., Tbr. Practice Forester, State Div. of Forestry, North Bend, Wash.; Univ. of Wash., B.S.F., 1949. J. W. Ridgeway, W. A. Tinney, D. R. Hopkins.

Perrigo, R. A., Rgr. Naturalist, Olympic Natl. Park, Port Angeles, Wash.; Univ. of Wash., B.S.F., 1949. C. H. Willison, R. A. Brandes, S. M. Floe.

Reeves, W. A., Cruiser & Land Exam., Weyerhaeuser Tbr. Co., Tacoma, Wash. Puget Sound.

Southeastern

Affiliate Membership

Sellers, J. D., Tbr. Marketing Spec., Alabama Agric. Ext. Service, Auburn, Ala. A. P. I., B.S., (Agric. Science), 1941. Southeastern.

Junior Membership

Beverly, P. C., Ochlochee, Ga.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Burns, J. G., Proj. Forester, Div. of Forestry, Montgomery, Ala.; A. P. I., B.S., 1947; Duke, M.F., 1949. J. Stauffer, R. Snyder, C. F. Attaway.

Findley, J. E., Asst. Head Scaler, Coosa Newsprint Co., Coosa Pines, Ala.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Hamby, E. W., Jr., 143 Gilbert St., Smyrna, Ga.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Howard, E. R., Fire Control, Fla. Forest Service, Tallahassee, Fla.; Univ. of Fla., B.S.F., 1949. R. A. Bonninghausen, C. H. Coulter, J. A. Butz

Hughes, A. L., Student, Univ. of Ga., Athens, Ga.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Johnson, H. D., Member Time Study Crew, St. Regis Paper Co., Pensacola, Fla.; Colo. A & M., B.S.F., 1949. D. B. Recknagel, G. W. Abel, H. D. Phillips.

Martin, R. W., Jr., Carlton, Ga.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, G. N. Bishop, B. F. Grant

McKelvey, C. G., Jr., Student, Univ. of Ga., Athens, Ga.; Univ. of Ga., B.S.F., 1950. G. N. Bishop, D. J. Weddell, A. C. Worrell.

Parnell, C. W., Grad. Student, Univ. of Ga., Athens, Ga.; Univ. of Ga., B.S.F., 1949. D. J. Weddell, G. N. Bishop, B. F. Grant.

Rich, A. A., Forester, St. Joe Paper Co., Port St. Joe, Fla.; Univ. of Ga., B.S.F., 1938. H. Goodrich, C. H. Coulter, R. A. Bonninghousen.

Roddenberry, R. F., County Forest Rgr., Ga. Forestry Comm., Atlanta, Ga.; Univ. of Ga., B.S.F., 1949. D. J. Weddell, G. N. Bishop, B. F. Grant.

St. John, C. H., Jr., 763 Highland Terrace, N. E. Atlanta, Ga.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, G. N. Bishop, D. J. Weddell.

Thompson, W. P., Field Inspt., U.S.F.S., McRae, Ga.; Univ. of Ga., B.S.F., 1949. D. J. Weddell, G. N. Bishop, B. F. Grant.

Turner, W. F., 103 N. Jefferson Ave., Clearwater, Fla.; Univ. of Ga., B.S.F., 1949. A. E. Patterson, A. C. Worrell, G. N. Bishop.

Wike, C. O., Student, Univ. of Ga., Athens, Ga.; Univ. of Ga. B.S.F., 1949. A. E. Patterson, A. C. Worrell, C. N. Bishop.

Upper Mississippi Valley

Junior Membership

Hammer, C. W., Student, Univ. of Minn., St. Paul, Minn.; Univ. of Minn., B.S.F., 1949. H. L. Hansen, A. E. Schneider, R. M. Brown.

Irving, F. D., Jr., Grad. Student, Univ. of Minn., St. Paul, Minn.; Univ. of Minn., B.S.F., 1949. R. M. Brown, J. H. Allison, A. E. Schneider.

Juntilla, H. W., Grad. Student, Univ. of Minn., St. Paul, Minn.; Univ. of Minn., B.S.F., 1949. R. M. Brown, D. P. Duncan, J. H. Allisen.

Kilen, G. F., Student, Univ. of Minn., St. Paul, Minn.; Univ. of Minn., B.S.F., 1949. F. H. Kaufert, A. E. Schneider, R. M. Brown.

Wisconsin-Upper Michigan

Junior Membership

Coleman, D. G., Chief, Div. Info. & Edu., Forest Products Lab., Madison, Wis.; G. W. Univ., A.B., (Lib. Arts), 1921. Wisconsin-Upper Michigan.

Davis, C. N. Forester, Mosinee Paper Mills, Mosinee, Wis.; Colo. A. & M., B.S.F., 1948. J. L. Deen, W. H. Schaeffer, J. V. K. Wagar.

Foreign

Junior Membership

Cole, W. H., Forest Supv., U.S.F.S., Rio Piedras, P. R.; Univ. of Mich., B.S.F., 1924. S. T. Dana, S. W. Allen, L. J. Young.

The following have been Junior members for at least 6 years and are eligible for advancement to Member grade. The Sections have certified them as actively engaged in forestry work and competent to represent the profession honorably and capably in the performance of their duties.

Inland Empire

Cox, R. G., Forester, Potlatch Forests, Inc., Lewiston, Idaho.

Ravenscroft, V. R., Ext. Forester, Univ. of Idaho, Moscow, Idaho.

Ozark

Lavely, J. E., 1221 Henderson St., Arkadelphia, Ark.

Lynch, D. B., Box 668, Pine Bluff, Ark.

Torgerson, G. H., 803 Crayton Ave., Gurdon, Ark.

Southwestern

Bradshaw, J. R. J., 2719 Santa Cruz Drive, Albuquerque, N. Mex.

Cutler, D. D., Santa Fe Natl. Forest, Santa Fe, N. Mex.

Harrington, D. G., Tuba City, Ariz.

Mazzetta, A. J., Beaverhead Route, Magdalena, N. Mex.

McDuff, C. E., Coconino Natl. Forest, Flagstaff, Ariz.

Perry, E. W., P. O. Box 8, Glenwood, N. Mex.

Washington

Leisenring, L. S., 4733 Homer Ave., S.E., Washington, D. C.

Maki, K. N., 307 S. Buchanan St., Arlington, Va.

Wisconsin-Upper Michigan

Anderson, Eric A., Forest Prods. Lab., Madison, Wis.

Johnson, R. W., Mich. College of Mining & Tech., Sault Ste. Marie, Mich.

Ridlington, Walter, Box 376, Shawano, Wis.

Skog, R. E., Court House, Marquette, Mich.

Steidemann, R. W., U.S.F.S., Three Lakes, Wis.

Names Dropped From Membership Roll

Below are the names of all persons whose membership in the Society has been terminated since publication of a similar list in the June 1949 JOURNAL OF FORESTRY.

Deceased

Fellow

Bates, C. G.
Gifford, J. C.

Member

Bloom, C. W.
DeCamp, Richard E.
Gisborne, H. T.
Hamel, A. G.
Helm, Harley J.
Jack, J. G.
Marks, Elmer R.
Morrill, W. J.
Moulton, Walter N.
Neff, Philip
Oxholm, Axel H.
Reed, F. W.
Rendall, Raymond E.
Rogers, Nelson S.
Secrest, Edmund
Toler, J. B.
Woodhead, Philip V.

Junior

Kling, John Bernard
Lindholm, Arthur E.
Neumuller, A. C.

Resigned in Good Standing

Member

Bradder, W. E.
Carlson, Leland H.
Carlson, Raymond
Dale, William P.
Folkestad, James O.
Fosdal, Arne
Gibson, James N.
Greene, John C., Jr.
Hetzel, John E.
Heywood, Benjamin B.
Ladd, Charles H.
Nielson, Merrill
Osborne, Ernest H.
Radel, Joseph T.
Rudolf, Paul
Sackett, Homer S.
Simson, A. G.

Smale, Frank W.
Wellwood, Robert W.
Whitney, Raymond L.
Wogensen, A. K.
Wulff, John

Junior

Berg, Lennart Y.
Collom, Charles R.
Dake, Lee J.
DeSpain, Owen M.
Garra, Anthony A.
Gill, Tyler S.
Gruenhagen, Richard H.
Harer, Mark T.
Katibah, George P.
Kier, William L.
Mazurak, Andrew Peter
Mermelstein, Sheldon B.
Rawlinson, John W.
Scott, Harry Carr
Stone, Raymond W.
Thomas, Herbert A.
Weller, Russell K.

Associate

Wiebe, Abraham H.

Resigned in Arrears

Member

Balthis, Russell F.
Jacobs, William F.
Lemmon, Paul
Martin, Dean W.
Yale, Allen R.

Junior

Ackerknecht, William E.
Dice, Ernest George
Epperson, Douglas H.
Galloway, Harry Merrill
Hubbell, Hubert T.
LeClerc, Gregoire Jean
Margolism Reuben
Melcher, Fred C.
Neale, Alfred T.
Neubrech, W. LeRoy
Post, Manlius J.
Salls, Milton R.
Smith, Harold E.
Werner, Harold K.
Williams, Robert E.
Wood, Lamar M.

Dropped, Nonpayment of Dues

Member

Bays, Isaac R.
Bergh, Thor K.
Bishop, Harold F.
Brown, Gordan L.
Buhrman, William T.
Burt, Wellington R.
Claridge, Bertram E.
Conrad, Alexander
Dresskell, Wilfred W.
Faulkner, Geo. A.
Gurley, Henry H.
Haley, William H.
Henderson, T. B., Jr.
Hestbeck, Fred M.
Hoffman, Henry C.
Hood, W. W.
Jacobson, Albin George
Johnson, R. Verle
Koski, Sulo O.
Lane, Kenneth J.
Leftwich, Fred O.
Mulholland, William D.
Nilsson, Adolph
Parker, Joe C.
Pettigrew, George W.
Phillips, J. Elbert
Robert, J. Conrad
Simmons, Frederick C.
Snider, William J.
Swain, Charles E.
Turner, John E.
Urquhart, J. C.
Wilson, Rex H.
Wood, Kendall B.
Woolfolk, Edwin J.
Yawn, Forrest W.

Junior

Allyn, Allan D.
Anthony, Joseph G.
Augustine, Marshall T.
Avrard, Jules E., Jr.
Baber, Thomas G.
Baskervill, William N.
Beal, Robert P.
Bell, Lester E.
Berry, Dick W.
Bingham, K. E.
Blackerby, J. Horton
Blackwood, John B.
Bork, John H.
Born, Carl J.
Boston, Wilbert L.
Bottke, Ernest August
Bowen, Robert O.
Brabee, J. M.
Bradley, Robert F.
Brame, Frank C.
Brandt, Arnold E.
Brethauer, Walter J.
Breuer, Vladimir, Jr.
Buell, Edward
Burns, Benton H.
Burns, Dale E.
Bylsma, Donald E.
Carnes, William C.
Cavanaugh, Kenneth C.
Combs, Charles K.
Connell, John L.
Craven, William H.
Crom, Donald D.
DeLoach, Harry G.
Deyo, Henry E., Jr.
Dion, Carl R
Driver, Charles
Dugan, William L.
Dunston, Robert L.
Edge, Newton P., Jr.
Engelking, Truman G.
Foster, William R.
Garman, Edward J.
Gierisch, Ralph K.
Gira, Paul A.
Gravem, Roy
Green, Morris
Gregg, Raymond,
Hamilton, Frank L.
Harmon, Marvin
Harris, Stanley W.
Hays, William R., Jr.
Heaton, Edward F.
Hopkins, George Murray
Huff, Richard E.
Jacobs, Marlon
Jakobson, Eric E.
Johnson, William R.
Kaiser, James G.
King, Frank C.
Kirk, Bernard M.
Kirkley, Eugene R.
Klein, Carlos G.
Klevens, Milton Jon
Knight, D. Manley
Koch, Edward C.
Kohlman, N. Charles
Koleman, Norman D.
Kuehn, Keith Alfred
Kunzweiler, John J.
LeConey, James E.
Lincoln, James P.
Liniger, Paul F.
Longmoor, Justin E.
Loomis, Joel C.
MacDonald, Robert B.
Marashinsky, Julius
Marrero, Jose
Martin, O. F., Jr.
Marvin, Virgil I.
Massey, Irvin M.
McAvoy, Merton W.
McBride, James Kelso
McKee, Ernest E.
McNees, Wayne A.
Meyring, Maxwell B.
Mills, Marvin Anson
Minear, Robert W.
Morgan, David Shannon
Nielsen, Vernon A.
Niles, Charles F.
Olsen, Forrest William
Paddock, Clifford M.
Page, W. D.
Panek, James Paul
Park, B. Ripley, Jr.
Pardee, Lloyd P.
Peck, Charles K.
Peterson, William A.
Peltier, Edward L.
Petzold, Albert O.
Phillips, Harold Morgan
Pritzlaff, Frederick C.
Pryce, Stephen D.
Pulkrabek, Leonard J.
Ratliff, Mark R.
Raubach, Robert T.
Reasoner, Henry A.
Reed, Maurice E.
Rochon, Stanley C.
Russell, DeWitt
Rutherford, Clarence E.
Sargeant, Howard J.
Schad, Charles C.
Schimerman, Lawrence A.
Schlapfer, Theo. A.
Scholz, Kenneth C.
Schrader, Victor D.
Schreyer, Charles E., Jr.
Settergren, Reuben G.
Shearer, Robert W.
Sherman, Arthur E., Jr.
Sherman, Irving W.
Siewert, George W.
Slavin, Otis W.
Smith, Alfred E.
Smith, H. E.
Smith, Ivan W.
Speck, Peter V.
Statt, Frederick G.
Stier, Roy E.
Stoddart, L. A.
Sullivan, Miles F.
Sydow, William B.
Thackeray, Robert M.
Thiede, Russell W.
Thomas, Robert K.
Thomson, F. MacRae
Throop, F. Ralph
Thurner, John T.
Thurston, William A.
Twoomey, Vincent W.
Van Akkeren, John J.
Wahl, Joseph D.
Wang, G. L.
Warner, David W.
Wassmansdorf, Ernest O.
Waters, W. V., Jr.
Weswig, Carl O.
White, Charles H.
Wigg, Paul A.
Wilde, Kenneth E.
Wilson, Thomas I.
Wortley, Randall G.
Zamor, Norbert A.

Affiliate

Conklin, Edward W.
England, Fred G., Jr.
Green, Fred R.
Harris, B. F.
Herndon, Thomas E.
King, James F.
Licke, George J.
Reeve, Walter L.

Associate

Campbell, Louis A.
Howard, Eugene E.
Klingaman, Harold E.
Little, Ernest L.
Paxton, Edward T.
Thompson, Roy A. H.

Elections

Junior

Binns, W. A., Ga.
Burgess, R. F., Me.
Burns, E. B., La.
Church, C. J., Mass.
Clark, D. W., Ariz.
Conrow, T. M., Calif.
Damon, H. F., Jr., N. H.
Darby, S. P., Jr., Ga.
Davis, T. S., N. C.
Dixon, M. J., La.
Faber, E. J., Wis.
Froehlich, J. L., Ill.
Fuller, G. R., N. C.
Garrison, J. E., S. C.
Griffin, B. F., Ark.
Griffin, F. S., Jr., N. C.
Gruenfeld, J. J., England
Gunderson, W. R., Mich.
Halberg, J. E., N. Y.
Hamilton, J. R., Ga.
Hanson, R. C., Calif.
Hawksworth, F. G., N. Mex.
Johnson, A. R., Minn.
Jungbacker, J. P., Ore.
MacAlpine, W. W., Wash.
Marshall, T. W., La.
Martz, R. C., Jr., Va.
McDonell, N. R., Ore.
McNally, J. A., Can.
Melrose, R. M., Wash.
Miglicco, A., La.
Nelson, C. L., Me.
Nelson, R. B., Ga.
Nicholson, J. L., Me.
Nicholson, R. L., Wash.
Parker, C. A., Iowa
Patterson, D. H., D. C.
Pellinger, J. J., N. J.
Petry, R. A., Wis.
Phifer, T. E., Ark.
Reinhardt, W. H., Mich.
Rogers, G. L., Va.
Schroeder, R. E., Wis.
Scott, T. R., Ark.
Smith, A. B., La.
Starks, H. B., Fla.
Thomson, K. G., Idaho
Wilson, A. D., Va.
Wright, K. H., Ore.
Wylie, C. W., Ore.

Member

McIntyre, R. N., Calif.
Suddarth, S. K., Ind.

Affiliate

Kern, L. E., Ind.

Associate

Potts, S. F., Conn.

Corresponding

Juncker, F. G., Denmark

Reinstatements

Junior

Bean, L. S., Va.
Carnegie, J. A., Ore.

Member

Covington, D. M., Wash.
Neitzling, F. J., Mont.
Smith, R. B., Fla.

Appalachian Section Holds Winter Meeting

The annual winter meeting of the Appalachian Section was held in the Hotel Sir Walter, Raleigh, N. C., on January 20 and 21, 1950. More than two hundred members and guests attended.

The opening morning session had as its theme "Benefits and Problems of Good Farm Forestry. Charles H. Flory, former Council member and state forester of South Carolina, presided. Speakers on this program included Frank Santopolo, W. Taylor, R. W. Graeber, and George W. Dean.

Lenthall Wyman, chairman of the Section, presided at the afternoon session, the subject of which was "Better Forests through Genetics." Among the speakers were I. T. Haig, Floyd M. Cossit, Paul H. Harvey, and Keith Dorman.

William S. Edmunds, secretary of the North Carolina Forestry Association, served as toastmaster at the Section dinner on Friday evening, January 20. The principal address, on European forestry, was given by L. I. Barrett, U. S. Forest Service, Washington, D. C.

At the Section business session on Saturday morning, committee reports were given and a report was made on Society affairs by Henry Clepper.

New officers were installed as follows:

Chairman, A. E. Wackerman, Duke School of Forestry, Durham, N. C.

Vice Chairman, Thos. H. Davis, Forestry Department, Champion Paper and Fibre Company, Canton, N. C.

Secretary-Treasurer, P. A. Griffiths, Department of Conservation and Development, Raleigh, N. C.

Additional members of the Executive Committee: G. E. Jackson and Lenthall Wyman.

Range Division Elects Officers

New officers for the Division of Range Management, to serve during the next biennium, were elected January 16, 1950, by mail ballot of the Division members. They are:

Chairman: Edward P. Cliff, U. S. Forest Service, Denver 2, Colo.

Vice chairman: Donald F. Hervey, Colorado A & M College, Fort Collins, Colo.

Secretary: Charles E. Poulton, Oregon State College, Corvallis, Ore.

Executive Committee: W. R. Chapline, U. S. Forest Service, Washington, D. C.; Raymond Price, Southwestern Forest and Range Experiment Station, Tucson, Ariz.; and Joe A. Wagner, Papago Indian Agency, Sells, Ariz.

JOURNAL OF FORESTRY on Microfilm

Library subscribers to the JOURNAL OF FORESTRY can now obtain through University Microfilms, Ann Arbor, Michigan, a Microfilm copy of Volume 47 of the JOURNAL OF FORESTRY. Cost to the library is just $3. The full year is on one reel in a box properly labeled and identified, with the index for the year at the beginning of the reel. Under the terms of the agreement with the publishers of periodicals thus made available the film may not be duplicated, nor can it be resold. In addition to the JOURNAL OF FORESTRY, over 150 other periodicals are similarly available on microfilm.

Japanese Wood Collection Gift to Society

The Forestry Division of the Natural Resources Section, General Headquarters of the Supreme Commander for the Allied Powers, has presented the Society of American Foresters with 40 wood specimens of Japan's more common commercial woods. Similar sets have been distributed to schools and other institutions interested in forestry. The Society's collection may be seen at the Society office, Mills Building, Washington, D. C.

Report Corrected

In the interest of accuracy in records, the following revised statement should be substituted on page 1004 of the JOURNAL OF FORESTRY, December 1949, for the first paragraph of the School Executives.

At an informal meeting of the executives of forestry schools in September, 1946, at Salt Lake City, under the chairmanship of Dean J. S. Illick, it was voted to form an organization to be known as the Council of Executives of Forestry Schools. There have been three meetings of the Council, all in conjunction with annual meetings of the Society of American Foresters: in December, 1947, at Minneapolis; in December, 1948, at Boston; and in October, 1949, at Seattle. Dean Walter Mulford served as the first chairman, 1946-1947, succeeded by Director F. S. Kaufert for 1948, Dean J. Lee Deen for 1949, and Dean Lewis M. Turner for 1950. The Council is composed of executives of the twenty-two accredited forestry schools in the United States.

Forestry News

Douglas-fir Super Race Seen

A super race of Douglas-fir trees is being planned for the West Coast region.

Calling it a "real milestone in American forestry," W. D. Hagenstein, chief forester, in his report before the annual meeting of the Forest Conservation Committee of Pacific Northwest Forest Industries, said the Douglas-fir industry in 1949 made forestry history when it adopted a region-wide seed certification policy for assuring superior trees from artificial reforestation.

"Adoption of this plan of genetic forestry which was followed by industry in western Washington and Oregon in 1949," Hagenstein said, "is a first for the United States, although Europe has been growing trees from certified seed for 100 years."

"The Forest Industries Tree Nursery, at Nisqually, Washington, which produces seedlings for use throughout the Douglas-fir region," Hagenstein said, "will hereafter use only certified seed. Each company receiving trees from the nursery is supplying its own seed, paying particular attention to place collected, elevation, form of parent trees, local climate and proximity to area needing artificial reforestation."

The industry's nursery committee is the certifying agency for superior tree seed and keeps systematic records on each lot so that its progeny can be followed and studied.

Grazing Fees Drop

Grazing fees on national forests will be lower, on the average, for 1950 than they were last year, according to regional forester Edward P. Cliff, U. S. Forest Service, Denver, Colorado.

This decrease reflects the current market prices received for livestock which determine national forest grazing fees on a sliding scale plan initiated by the Forest Service in 1933.

Prices received for cattle by the stockgrowers in the western states averaged 14 percent less in 1949, compared with 1948. As a consequence, grazing fees on the national forests will be 14 percent less. The grazing fee for the grazing of cattle on the western national forests averaged 49 cents per animal month in 1949. For 1950, this charge will average 42 cents per animal month.

Sheep grazing fees will average 10.75 cents per ewe-month in 1950, compared with 11 cents in 1949.

George Spaur

Spaur Named Oregon Forester

George Spaur has been appointed state forester of Oregon by the Oregon State Board of Forestry. Since September 18, following the death of State Forester Nelson S. Rogers, he had been serving in an acting capacity. Spaur is the sixth state forester since the office was established in 1911. He was named deputy state forester in 1946 following his return from war service with the Ninth Army Corps in the Pacific and with General MacArthur's occupation forces, where he assisted in an economic survey of the Japanese islands. A native of Oregon, he is a graduate in forestry from the Oregon State College. He is a Member of the Society of American Foresters and of Xi Sigma Pi, the national forestry honorary fraternity.

Southern Resources Study

One of the broadest studies ever undertaken in the South has been authorized by the Board of Control for Southern Regional Education. At its meeting in November in Biloxi, Mississippi the board approved South-wide surveys, to begin in 1950, of the region's resources and opportunities for economic improvement and industrial and agricultural growth. The surveys will also produce a picture of the needs for trained and educated manpower to produce the development. Studies will be outlined and supervised in each state by a commission to be appointed by each state governor this spring. Commissions will include industry and business representatives and research and education leaders.

Stoddard to Izaak Walton Staff

Charles H. Stoddard of Minong, Wisconsin has been appointed activities director of the Izaak Walton League of America, with headquarters in Chicago, Illinois. A graduate of the University of Michigan, School of Forestry and Conservation in 1934, he performed graduate work under a Charles Lathrop Pack Forestry Foundation fellowship in 1938. Prior to the war he served as a forest economist with the U. S. Forest Service and as a land economist with the Bureau of Agricultural Engineering. During three years service with the Navy, he was assigned to the Solomon Islands where on jungle trips he discovered several new species. One of these, *Mastixiodendron stoddardii*, was named for the discoverer. Since the war, he has been engaged on a Pack research fellowship and has published *Forest Farming and Rural Employment*.

First Quarter Century of Industrial Forestry Marked

In October 1949 the Nekoosa-Edwards Paper Co., Port Edwards, Wisconsin celebrated completion of its first 25 years of industrial forestry operations. More than 300 persons attended a banquet at which public and private forestry officials and administrators commended the company's forestry record. Prior to the banquet a tour of the company's nursery and plantations and an examination of its fire line construction and fire fighting equipment was made.

Tree Farm Acreage, 20 Million

At the close of 1949, the American Tree Farm System which started in the State of Washington in 1941 had spread to 27 states, with 2,242 tree farms and a total forest land area of 20,010,102 acres, according to a report by the American Forest Products Industries, Inc. For the fifth consecutive year the South led all other regions in Tree Farm growth with a total of 1,151,759 acres. Since the program first began, sponsors in nine states have cancelled certificates of 82 owners whose holdings totaled 233,306 acres, because of change of ownership or failure to maintain the standards of protection and management required. Minnesota will dedicate its first tree farms in the spring of 1950. Louisiana and New Hampshire are expected to launch tree farm programs during the year.

William B. Rice

William B. Rice (1888-1950)

William B. Rice, regional forester, U. S. Forest Service, Ogden, Utah died suddenly on a train enroute from McCall, Idaho to Ogden on January 13.

Ben Rice had been regional forester of the Intermountain Region since January 1, 1944. Born in Berlin Heights, Ohio, May 22, 1888, he was graduated from the College of Emporia at Emporia, Kansas in 1910 and received his Master's degree in forestry from Yale University in 1912. He entered the Forest Service in 1912 as an assistant on the Payette National Forest in Idaho. In 1920 he was assigned to the Cache National Forest in Utah and Idaho, and in 1921 he became forest supervisor of the Weiser National Forest in Idaho. From 1925 to 1937, when he was named assistant regional forester in charge of timber management, he served as supervisor of the Payette Forest. Appointed associate regional forester in February 1939, he became regional forester in 1944.

Nelson to Fire Control Post

Marion Nelson has been named assistant chief of the division of fire control in the Washington, D. C., office of the U. S. Forest Service. His transfer from the position of supervisor of the Umpqua National Forest in Oregon became effective February 20. A native of Colorado, Nelson is a forestry graduate of the University of Washington. In 1935 he joined the Forest Service as a junior forester on the Mt. Baker National Forest. Since 1946 he had been supervisor of the Umpqua forest.

Fellowships Offered In 14 Forestry Fields

Twenty-one graduate fellowships for the college year 1950-51 in 14 fields of forestry and forest products study are offered by the College of Forestry (Syracuse) of the State University of New York, Dean Joseph S. Illick has announced.

Stipends vary from $900 to $1,350 for a nine-month period, and holders of the fellowships are excused from paying college tuition and laboratory fees normally amounting to about $360 a year. Recipients are required to assist in teaching and research work for a maximum of 15 hours a week.

Fellows may pursue studies leading to the M.F., M.S., and Ph.D. degrees and may choose specialties among forest botany, forest entomology, wildlife management, silviculture, forest management, forest administration, forest economics, photogrammetary applied to forestry, landscape and recreational management, wood technology, forest products manufacture and utilization, pulp and paper manufacture, and wood chemistry and plastics.

The college's program in plastics and cellulose chemistry will begin its second year in September. It is one of only two programs of its scope in the country, and the only one offered by a forestry school. The master's part of this new program gives specialization in the high polymer and plastic field, or the cellulose field for technical or research positions. Ph.D. candidates receive thorough fundamental training in the chemistry of cellulose and high polymers for positions of research or of technical responsibility.

Aid to deserving graduate students offered by the College of Forestry falls in three categories: 1. *Industrial Fellowships* sponsored by industries and associations and administered by the college. No service is required by the college. The student may be obliged to work on a problem or in a field specified by the institution, however. 2. *Special Assistantships*, in limited number, at an hourly rate of pay for special teaching and research work. 3. *Scholarships* covering tuition, for deserving out-of-state students. These cover tuition and fees to the amount of $360 a year.

Farm-game Projects Increase

Including 657 individual farm-game restoration projects in 1949, over 969 have been started in Michigan since the inception of the joint farm-conservation department wildlife habitat improvement program. The program began in March, 1948.

Oak Wilt Spreads Underground

Oak wilt, now widespread in several midwestern states, spreads from tree to tree my root grafts which occur naturally underground, J. E. Kuntz and A. J. Riker, plant pathologists of the University of Wisconsin, told a meeting of the American Phytopathological Society on December 30.

Normally these underground root grafts, caused as the roots from several trees grow together, benefit all the trees. But when oak wilt strikes, the underground grafts act as a pipeline carrying the disease from one tree to the other. Kuntz and Riker have dug up hundreds of root grafts in studying the disease. In one case they found 28 root grafts between two trees 12 feet apart. Breaking these underground ties, either by spade or by chemicals, has been successful in stopping the disease in more than a dozen cases so far, they reported.

Interior Holdings, Park Problem

At least 100 years will be passed before the national parks include all the 500,000 acres of non-federal lands within their boundaries, according to Secretary of Interior Oscar L. Chapman. Speaking before a dinner given in his honor by the American Planning and Civic Association in Washington, D. C., on January 19, he said, "There is, of course, a great back-log of national park needs not yet met. For instance, take the matter of non-federal lands within park boundaries. Though the willingness of the Congress to provide funds with which to acquire these areas within the national park system during the past three years, has been encouraging, with the amounts made available it would take at least 100 years to bring into federal ownership the more than 500,000 acres of private and state lands remaining."

"Woody" Cartoon Book Available

Woody, the little cartoon character with the engaging smile, is carrying his fight against man-caused forest fires into the school rooms of America. American Forest Products Industries expects to mail 100,000 Keep America Green posters to elementary and high schools in all 48 states during 1950. Woody is the central figure on every poster. His message "Let's Keep America Green," is designed to impress school children with the importance of forest protection and fire prevention in their home communities and in the country generally.

New York Foresters Employed Mainly in Forest Industries

Preliminary findings in a study being made of the employment of graduates of the New York State College of Forestry indicate that 34 percent of the foresters find employment in private industries. Of those men actually employed directly in forestry or in work closely related to it, 46 percent are with industry.

Questionnaires mailed to members of every class from 1913 through 1949 were returned by over 70 percent of the former students. Employment breakdown for the 1,274 responses received is: U. S. Forest Service, 7.7 percent; other federal agencies, 6.4 percent; state agencies, 7.8 percent; local governments, 2.4 percent; private forest industries, 34 percent; self-employed or privately employed in landscape and recreational management, 3.6 percent; self-employed in forestry other than landscape or recreational work, 2.7; teaching or engaged in study, 7.3; miscellaneous forestry employment, 1.1 percent; and primarily in non-forestry work, 27 percent.

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Elm Propagation Speeded

Some of the more recent efforts to insure an elm-shaded future in spite of destructive diseases now threatening the American elm were described December 30 at a meeting of the American Association for Advancement of Science, held in New York. T. W. Bretz of the U. S. Department of Agriculture and the Missouri Agricultural Experiment Station, and Roger W. Swingle of the Department and the Ohio Agricultural Experiment Station reported success in devising a method of rapid propagation of cuttings of elms of recently found strains resistant to the Dutch elm disease and the phloem necrosis virus.

The method consists essentially in dipping the ends of the leaf-bud cuttings in a powdered root-growth-regulating hormone, indolebutyric acid, before setting them in the rooting medium. Then they are kept under a constant water mist for 14 to 21 days.

Bretz and Swingle reported rooting averages in some lots of treated material up to more than 88 percent, whereas with other lots the best of the untreated cuttings rooted at around 50 or 60 percent and some lots did not root at all. They reported some success with this same method in rooting cuttings of hybrid chestnuts.

Essay Contest Announced

Junior and senior forestry students registered for the fall of 1950 in any of the six accredited forestry schools in Montana, Idaho, Washington, Oregon, California, and British Columbia are eligible to submit essays on the subject, "Some Economic Aspects of More Complete Utilization of Forests Stands," in a contest for prizes offered by the Western Forestry and Conservation Association. First prize will be $100; the second, $75. Each prize winner will also receive full expenses to the Association's annual conference, which this year will be held in December in San Francisco.

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L. V. Kline

L. V. Kline (1904-1950)

Ludwig V. Kline, chief, Forest Investigations Branch, TVA Division of Forestry Relations, died of a heart attack January 31, while en route from his home in Norris, Tennessee, to Knoxville to attend a conference.

He was born in Germany, but came to this country while still young and was naturalized in 1912. He attended high school at Elmhurst, New York, received his B.S. degree from New York State College of Forestry in 1928 and his M.S. from the same institution in 1931. He had also put in two years of special study toward a Ph.D. in plant science. During his school years, Lu worked at metal and wood pattern making, as a research assistant in poplar breeding experiments and wood technology, forestry instructor at Pennsylvania State College, and timber stand improvement foreman on the George Washington National Forest. In April 1935 he joined TVA as an assistant forester.

New Supervisor, Harney Forest

Eugene R. Lepley has been appointed supervisor of the Harney National Forest with headquarters at Custer, South Dakota. He will replace Marion J. Webber, who retired on December 31, 1949.

Lepley, who has been assistant supervisor of the Harney forest, entered the U. S. Forest Service in 1930. He served as a ranger on a number of forests throughout the Rocky Mountain Region until 1937 when he was appointed assistant supervisor of the San Isabel forest. Later he transferred to the Routt National Forest.

Progress Study Launched

A study to establish plus and minus trends in American Forestry since the completion of the last major forestry appraisals in 1944 is being launched by the American Forestry Association. Results of the study will be released in the fall of 1950. Coverage of the study and report will include: (1) 1944 status; (2) legislation and appropriations since 1944; (3) state activities; (4) federal activities; (5) private industry activities; (6) developments in methods, equipment, etc.; (7) financial status of forestry movement.

Guiding the study is a Forest Progress Committee composed of Ovid Butler, chairman, A. G. Hall, secretary, Henry Clepper, John D. Coffman, G. H. Collingwood, George W. Dean, George A. Duthie, Charles A. Gillett, R. C. Hall, L. F. Kneipp, R. E. McArdle, James E. Scott and Edward Stuart, Jr.

Specialized studies contributory to the final report will be made by "task forces" under the chairmanship of the following men: A. A. Brown, forest fire protection; Lee Hutchins, insect and disease protection; G. H. Collingwood, control of destructive forest practices; George A. Duthie, forest planting; Ralph W. Marquis, taxation, credits, and insurance; Henry Clepper, forest and forest products research; John B. Woods, forest ownership; Howard Zahniser, parks, wildlife, water, and other non-timber values of forests; E. C. Crafts, forest surveys; James E. Scott, financial status of forestry movement; S. L. Frost, public education to importance of forests to economic and social life; Ralph Unger, education and assistance for small forest owners; and Clyde S. Martin, timber management. Through arrangements with the Association of State Foresters, the committee and task forces will work in cooperation with George H. Dean in obtaining data from state forestry agencies.

Ovid Butler, chairman of the Forest Progress Committee, says the survey and report are being initiated with the long range view of five-year inventories which will be of value to (1) foresters by pointing up and delineating the weak and strong points of their professional fields; (2) the public, by keeping it currently abreast of progress or lack of progress in the conservation of forest resources, nationally, regionally and by states, and (3) forest agencies, private and public, by providing periodically up-to-date information helpful in the determination of action programs.

John C. Kuhns Retires

John C. Kuhns, assistant regional forester, Pacific Northwest Region, U. S. Forest service, retired January 1. He had been chief of the division of information and education in the Portland regional office since 1937.

A native of Pennsylvania, he attended the Pennsylvania State College, and entered the Forest Service July 1, 1910, as a guard on the Umpqua National Forest, Oregon. In 1931, he was selected to make a tour of the eastern forest schools lecturing on national forest administration. In the spring of 1933, when the old Rainier forest was divided between the Columbia (now Gifford Pinchot) and Snoqualmie forests, Kuhns was made supervisor of the enlarged Snoqualmie forest, with headquarters at Seattle. While in Seattle he was the Forest Service representative on various committees of the state planning council and the land use planning committee of the Department of Agriculture in Washington, and also had general supervision of Navy civilian conservation corps camps.

Kuhns was promoted in 1937 to the position of assistant regional forester in charge of the division of information and education, and transferred to Portland in 1939. Kuhns is a Member of the Society of American Foresters.

From Pony Express to Airliner, The Saga of Douglas-fir Seed

Its first overseas shipment of Douglas-fir seed by air was recently announced by the Manning Seed Company of Roy, Washington. The company's first shipment was to New York State in 1871 by pony express. The air cargo shipment was made to Denmark so that seed may be ready for early spring planting.

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Plant America—New Movement For More Natural Living

Governor James H. Duff of Pennsylvania was the leading speaker at the formal launching of a program to "Plant America — for More Natural Living." Initiated by the American Association of Nurserymen, the program has received the backing of a long list of conservation and other organizations throughout the country. All such organizations have been asked to give their support to stimulate tree planting for forests, farms, cities, and towns. Objectives are to increase economic values through planting as well as to beautify homesites, roadsides, schools, churches, and factories. Plan is to organize local committees in each community to suggest projects for local action. State-wide committees will cooperate with the "Keep Green" movement and similar state programs. It is anticipated that permanent committees will be established by garden clubs and conservation groups to continue the program after the initial impetus of the organizing campaigns.

Jaycees Launch Forestry Plan

As one of its action programs in agriculture and conservation the Junior Chamber of Commerce has initiated a tree planting project in each state. Aim of the project is to have each Jaycee chapter purchase 5,000 seedlings for each Vocational Agriculture Chapter or 4-H Club in their trading areas. Working through state supervisors of vocational agriculture, extension foresters, state foresters, and others, species will be selected which can be planted for windbreaks, shelterbelts, erosion control, or farm woodland improvement. Jaycees will assist the local farm youth groups in the initial plantings. It is estimated that probably as many as 10,000,000 trees can be planted this year through the stimulation afforded by the Jaycee program.

Carbon Black Speeds Thaw

Recently, the U. S. Forest Service reports, carbon black was used to speed the breakup of ice in high lakes where trout were to be seined for egg taking. Twenty inches of snow and 24 inches of solid ice melted in 15 days following the application of the carbon black. Considering the use of this material in place of hard-to-find soil, experimenters have found that application of two pounds of carbon black per chain of snow-covered trail would be effective for breaking pack trails through snow banks in the spring.

Chester J. Olsen

Olsen Named Regional Forester

The promotion of Chester J. Olsen, for the past 10 years assistant regional forester in charge of informational and educational activities at Ogden, Utah, to regional forester for the Intermountain Region was announced January 20 by the U. S. Forest Service.

A native Utahan, with 30 years experience in the Forest Service, principally in Idaho, Wyoming, Utah, and Nevada, he will administer 20 national forests, covering around 30 million acres. Mr. Olsen grew up on a ranch and attended the Utah State Agricultural College. Before entering the Forest Service he engaged in work with livestock. He is considered one of the top range management officials in the region.

Native Chestnuts Wanted

Since June 1949, Thomas J. Page, agricultural director of radio station WNBC, New York City, has been endeavoring through his broadcasts to obtain information concerning large living American chestnut trees. Scores of replies, with accompanying leaf specimens, have enabled him to locate many young trees from which pollen may be obtained for breeding work. He is cooperating with Arthur H. Graves of Yale University, School of Forestry.

Forest Survey of Western and Central Tennessee

Forest statistics for western and central Tennessee, the first results of the state-wide forest survey that began in 1948, have been released by State Forester J. O. Hazard and Chas. A. Connaughton, director of the Southern Forest Experiment Station, New Orleans.

Niewenhous to NSRB Post

Mathias Niewenhous, who has served a number of government agencies since the early days of World War II, has been appointed chief adviser on forest products for the National Security Resources Board by Presidential Assistant John R. Steelman, acting chairman of the Board.

The new Resources Board official was deputy director of the lumber division in the War Production Board and remained with the successor agency, the Civilian Production Administration, as director of its forest products division during the reconversion effort.

Under the dissolution of the CPA, Mr. Niewenhous joined the Department of Commerce's Office of Industry Cooperation, where he was chief of the building materials negotiating division. His most recent assignment has been as chief of the forest products branch of the Economic Cooperation Administration, for which he made several trips to Europe to study requirements for lumber and building materials.

John D. Mylrea of Wausau, Wis., who has been assisting the materials office as a part-time adviser on mobilization planning problems affecting forest products, will continue to serve as a consultant.

Trees Today and Tomorrow

Produced by Southern Educational Film Production Service, Athens, Ga., "Trees Today and Tomorrow," a new 22-minute color motion picture, demonstrates methods any small owner can follow to make extra income from management and marketing of timber from his woodlands. Premier showing was before a Mississippi bankers' convention in January. Bookings for the film are being made through James Therrell, extension forester, Starksville, Miss.

Forestry Filmstrip Available

"America has many forests to use and to enjoy. We can have these always if we protect trees from fire and use them wisely." This is the theme of a recently published picture book and filmstrip, *The Story of Forests*, now available for use in elementary schools. Prepared by American Forest Products Industries, Washington, D. C., the picture book and filmstrip stress forest fire prevention and good woods management. Copies of the 16-page picture booklet are already in the hands of school officials in all 48 states. The 34-frame, 35 mm. filmstrip is being offered to film libraries maintained by the state educational departments.

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Walter B. Averill (1901-1950)

Walter B. Averill, resource management staff assistant on the Green Mountain National Forest, died of a heart attack at his home in Rutland, Vermont, on January 21.

Mr. Averill, born in Winn, Maine, was 49 years old. He was a Navy veteran of World War I, a Legionnaire, a Mason, and a Member of the Society of American Foresters. He held degrees in forestry from the University of Maine and Harvard University. He had been associated with the U. S. Forest Service for the past 17 years and served on five of the seven national forests in the Northeast.

Lodgepole Facts Folder Published

A four-page illustrated folder, an addition to a series which covers the three western pines and two associated species has been published by the West-Pine Association. It reviews the growth range and characteristics of lodgepole pine timber and the properties and uses of lodgepole lumber in the building field.

Other *Facts Folders* published by the association cover Idaho white pine, ponderosa pine, sugar pine, white fir, and Engelmann spruce. Single copies of the lodgepole publication are free upon request to Western Pine Association, 510 Yeon building, Portland 4, Ore.

New Douglas-fir Directory

"Where to Buy," is the title of a new and fully revised membership directory published by the West Coast Lumbermen's Association, Portland 5, Oregon. It gives detailed information on sawmills, remanufacturing plants, fabricators, and wood treating plants in the Douglas-fir region of Washington, Oregon, and northern California. The directory is twice the size of last year's edition. Inclusion of much new material makes it a handbook of buying information for Douglas-fir, hemlock, red cedar, and Sitka spruce.

A Degree in Conservation

San Jose State College, California, has announced the first of four majors in conservation leading to an A.B. degree. This is in wildlife conservation. Curricula in soil conservation, forest and range conservation, and in conservation education will be offered later.

New Canadian Forestry Act

The Canada Forestry Act, passed by the Canadian Parliament in December, empowers the federal government to establish national forests on Crown lands and to engage in increased forest protection and forest research activities. The Resource Minister may also enter into agreements with any province for the protection, development or utilization of forest resources.

FOUR PH.D. DEGREES IN FORESTRY were awarded, for the second successive commencement, by the New York State College of Forestry, January 29. It is understood that four is the largest number of Ph.D. degrees to be awarded at one time by a forestry school. Assistant Dean Hardy L. Shirley, in charge of graduate studies, is shown congratulating the mid-year quartet, who are, left to right, Dean Boyd Richards of Baca County, Colo., forest botany and pathology; Jacob Shapiro, Salem, N. J., forest zoology; Robert R. Morrow, Willseyville, N. Y., silviculture; and Maurice M. Alexander, Syracuse, N. Y., forest zoology. The College of Forestry at Syracuse University, which has a 1949-50 enrollment of 88 in post-graduate forestry study, also granted nine M.S. degrees at mid-year, for a total of 13 advanced degrees as compared with eight baccalaureate degrees. Six of the nine M.S. degrees went to foreign students representing Sweden, Turkey, and 2 each from Chile and India.

Miss Jewell Gordon of Mineral Springs, N. C., is crowned "Miss Forestry Demonstration of 1950" by Jerry Price. North Carolina state FFF forestry winner of 1949.

A New Interest Stimulator—"Miss Forestry Demonstration"

Taking a cue from the interest-arousing popularity contests in other fields, foresters in North Carolina crowned "Miss Forestry Demonstration of 1950 at a field demonstration day held at Wesley Chapel School, Union County, North Carolina, January 13. The field day which drew an attendance of between 600 and 800 persons was arranged by P. A. Griffiths, Fred Claridge, and R. Moring of the North Carolina Division of Forestry, and Wayne Mangum, vocational agriculture instructor in cooperation with with Robert N. Hoskins, forester with the Seaboard Railroad. The group was introduced to stand improvement measures on three demonstration plots, and were shown the operation of tree planters and power saws by George W. Mosely of the Forest Equipment Co., Jacksonville, Florida. Featured speaker was A. E. Wackerman of the Duke University School of Forestry and recently elected chairman of the Appalachian Section, who spoke on the control of hardwoods in pine stands through the use of Ammate poisoning.

Consultant Opens New Line

Richard F. Howard, consulting forester, Franklinville, New York, has set up a distribution and service agency for power chain saws, wood burning stoves and furnaces. He believes a lot of good forestry can be practiced if farmers can be induced to utilize as fuel low-grade material from stand improvement work.

New School of Forestry

The Division of Forestry, North Carolina State College, will become the School of Forestry on July 1. Announcement of the academic advancement of the division, which has been a part of the College's School of Agriculture since its establishment in 1929, was made by Chancellor J. W. Harrelson and Dr. Richard J. Preston, Jr., director of the Division of Forestry. The new school will have equal academic rank with other institutions of its kind and will offer a wider range of services in education and research. The division now has 250 students, including 9 graduate students, and it has graduated more than 400 students.

Candy Coated Conservation

Fifty thousand sticks of gay peppermint candy, with the message "Keep Louisiana Green—Stop Forest Fires—Grow More Trees" imprinted on their colorful cellophane wrappers, are being distributed to Louisiana children by International Paper Company as part of its continuing forestry educational program.

The idea conceived by Charles W. Robertson, conservation forester, and Miss Edna Potter of the paper company's public relations department, emphasizes to the youngsters, particularly in rural areas, the necessity for being caution with fire in the woods.

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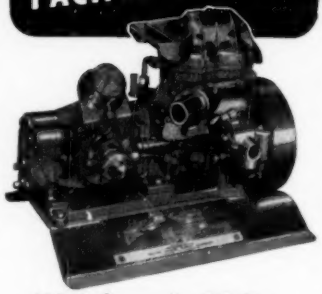

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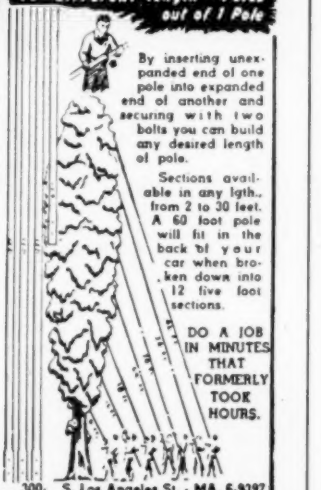

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Big Valley Sustained Yield Unit Approved

Lyle F. Watts, chief of the U. S. Forest Service has approved the proposed sustained yield unit in the Big Valley area of Modoc and Lassen counties, California. Involved are 82,000 acres of the Modoc National Forest, from which an allowable cut of 8,000,000 board feet will be harvested for the first ten years. The Forest Service will continue to sell timber on competitive bidding, in the area, but will require that it be manufactured into lumber in the Big Valley area. Four mills now operate in the area.

Planes Spot Pole Blight

Airplane scouting was the opening move last summer in a fight started by forest pathologists of the U. S. Department of Agriculture and the University of Idaho against the pole blight of western white pine. The distinct yellow color, sparse foliage, and shortened terminals of the affected trees made it possible for airplane scouts to locate diseased trees from heights of from 500 to 1,000 feet above the tree tops. It is believed that the use of airplanes speeded up the scouting job by many months or even years.

SAF Member Wins Mercer Award

A member of the Society of American Foresters, Dr. E. J. Dyksterhuis, was announced the winner of the 1949 George Mercer award by the Ecological Society of America. The announcement was made at the 34th annual meeting of that organization in New York City on December 28, 1949.

Dr. Dyksterhuis' monograph which was the basis for the award was on a great belt of savannah in Texas called the Western Cross Timbers. It appeared in the July 1948 issue of *Ecological Monographs*.

He is chief of the regional range division, Northern Great Plains Region, Soil Conservation Service, Lincoln, Nebr.

Pennsylvania Association Meets

On March 17 and 18, the Pennsylvania Forestry Association will hold its annual meeting in the Penn Harris Hotel, Harrisburg Pa. "Current Forest and Conservation Trends in Pennsylvania" will be the general theme of the meeting with discussion centered around education, action, and legislation. Major revisions of the association's bylaws are expected to be approved at the business session of March 18.

SHOWN ABOVE planting a pine tree in connection with Louisiana's celebration January 6 of "Henry E. Hardtner Memorial Forestry Day" is Charlotte Tannehill, Urania, Louisiana, niece of the late, great "Father of Southern Reforestation." Included in the state-wide celebration honoring the noted forestry advocate was a program held at Urania, his former home. Pictured above are State Forester James E. Mixon, Judge Vinson Monser, principal speaker at the event, Miss Tannehill and Q. T. Hardtner, brother of the late forest conservationist. Students from the Urania High School watch the ceremonies from the background. Henry E. Hardtner was an Associate Member of the Society of American Foresters.

Positions Wanted

Duke School Forestry Graduate, B.S. 1946 M.F. 1947. One and a half years' experience as District Forester with State Division of Forestry; one year's experience as Manager of Forestry Department for one of the largest home-grown timber merchants in England. Returned to states in November and desires permanent position with forestry-minded company or State Conservation Agency. References and details forwarded on request.

Box O, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester, 23, married; graduate of Michigan State College, B.S. in 1948, and Duke University, M.F. in 1949. Six months' experience with U. S. Forest Service in forest soils research. Excellent background in mathematics. Desire permanent position as forester with forestry-minded company. References and details upon request. Lake States preferred.

Box A, Journal of Forestry, Mills Building, Washington 6, D. C.

Michigan State graduate, B.S.F., 1924. Sixteen years with U. S. Forest Service. Nine years forest management and administrative, 5 years timber production, and wood utilization, research; two years Forest Products Laboratory, softwood waste markets and utilization studies and low grade hardwood timber and log utilization research. Desire permanent position in forestry or wood utilization. References and details on request.

Box S, Journal of Forestry, Mills Building, Washington 6, D. C.

Michigan State College graduate, B.S., 1941 in Forestry and soils, desires position with private forestry organization. Fourteen months with U. S. Forest Service, 7½ years with mining and paper companies in Lake States, surveying, cruising, mapping, logging contracts, some experimental work. Details and references upon request.

Box P, Journal of Forestry, Mills Building, Washington 6, D. C.

Graduate Forester, 29, University of Minnesota, B.S., 1942 and M.F., 1948. Three years private industry in management, cruising, and logging supervision; 3 months landscaping. Data and references on request.

Box Q, Journal of Forestry, Mills Building, Washington 6, D. C.

Forestry graduate, 36, highly successful 15 year record in logging, timber management, and sawmill operation desires opportunity in lumber or paper manufacturing and business administration under top executives of aggressive company.

Box R, Journal of Forestry, Mills Building, Washington 6, D. C.

Forester with 6 years' experience in Liberia, Korea, and Japan, desires position in foreign forest production. Has B.S. and M.S. from Michigan State College and currently enrolled in special studies at the University of Michigan. Detailed information and references on request.

Box B, Journal of Forestry, Mills Building, Washington 6, D. C.

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Wood Division of ASME to Meet

The Wood Industries Division of the American Society of Mechanical Engineers invites the members of the Society of American Foresters to attend and enter into the discussions at the ASME National Meeting at the Hotel Statler in Washington, D. C., April 12-14, 1950. Since the Society of American Foresters is cooperating with ASME on these sessions, the registration fee has been waived for Society members.

On Thursday afternoon, April 13, the Timber Engineering Company laboratories, covering a wide range of research in wood products development, will be inspected. Friday morning, April 14, top notch research, industrial, and forestry authorities will survey and discuss postwar developments in wood products research, how increased mechanical efficiency is being obtained in the southern pine region, the use and application of machines in forestry, and review the report of the Society's committee on wood cutting tools and equipment.

Thomas R. C. Wilson (1895-1950)

Thomas R. C. Wilson, 65, retired former chief of the division of timber mechanics, Forest Products Laboratory, died suddenly on January 10 while en route by train from Minneapolis to Madison, Wisconsin. He had retired from the laboratory's staff in December 1946 after 36 years of distinguished work in the U. S. Forest Service. Since his retirement he had been engaged in industrial consulting work. Joining the laboratory staff in 1910, he gained world recognition among authorities on engineering properties of wood and wood structures. In recent years he had been specializing in the field of laminated structural members.

Wildlife Week in March

The 13th annual National Wildlife Restoration Week will be observed March 19 to 25 under the sponsorship of the National Wildlife Federation. The annual observation was initiated in 1938 by Presidential proclamation. Purpose is to focus attention of the American public on the importance of wildlife conservation. State, county, and local group meetings will direct public discussions of wildlife management through better management of all natural resources. Distribution of Wildlife Conservation stamps during the week is part of the program. Proceeds from the sale of stamps help carry on wildlife programs.

Burgess Heads Pest Control Work

Emory D. Burgess, U. S. Department of Agriculture entomologist, has been appointed an assistant in the Bureau of Entomology and Plant Quarantine. He will participate in the direction and development of the operations carried on by the Bureau in cooperation with state and local agencies to eradicate or control outbreaks of insect pests and plant diseases, including control programs against such insect pests as grasshoppers, Mormon cricket, gypsy moth, white-fringed beetles, Japanese beetle, and plant diseases such as white pine blister rust. He has been associated for the past 3 years with the division of gypsy moth control of the Bureau of Entomology and Plant Quarantine, with headquarters at Greenfield, Mass.

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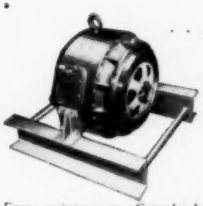

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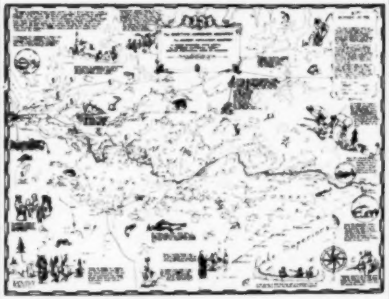

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Journal of Forestry

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of the

Society of American Foresters

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Constitution

Articles of Incorporation

THIS is to certify that we, whose names are hereunto subscribed, citizens of the United States, a majority of whom are citizens of the District of Columbia, have associated ourselves together, pursuant to provisions of Chapter XVIII, sub-Chapter III, of the Code of Law for the District of Columbia, approved March 3, 1901, and Acts of Congress amendatory thereto, under the corporate name of SOCIETY OF AMERICAN FORESTERS.

The term for which the Society is organized is perpetual.

The particular business and objects of the Society are to encourage a broad and constructive practice of forestry; to stimulate research and achievement in the science of forestry; and to advance the profession of forestry through cooperative thought and a spirit of solidarity among foresters.

The number of managers of the Society shall for the first year of its existence be eleven.

Witness our hands this 3d day of October, A. D. 1928.

R. Y. STUART,
R. V. REYNOLDS,
OVID M. BUTLER,
JOHN H. FAHRENBACH,
BERNARD A. CHANDLER.

District of Columbia, *ss:*

I, Margaret S. Sears, a Notary Public in and for the District of Columbia, do hereby certify that R. Y. Stuart, R. V. Reynolds, Ovid M. Butler, John H. Fahrenbach, and Bernard A. Chandler, parties to the foregoing and annexed Certificate of Incorporation of Society of American Foresters, bearing date on the 3d day of October, A. D. 1928, personally appeared before me in the District aforesaid the said R. Y. Stuart, R. V. Reynolds, Ovid M. Butler, John H. Fahrenbach, and Bernard A. Chandler, being personally known to me to be the persons who made and signed the said certificate, and severally acknowledged the same to be their act and deed for the purposes therein set forth.

Witness my hand and official seal this 3d day of October, A. D. 1928.

MARGARET S. SEARS,
Notary Public, D. C.

Article I
Name

The name of this Society shall be SOCIETY OF AMERICAN FORESTERS.

Article II
Objects

The objects of this Society shall be to represent, advance, and protect the interests and standards of the profession of forestry, to provide a medium for exchange of professional thought, and to promote the science, practice, and standards of forestry in America.

Article III
Membership Defined

Sec. 1. The membership of the Society shall consist of Junior Members, Members,[1] Fellows, Affiliate Members, Associate Members, Corresponding Members, and Honorary Members.

Sec. 2. Members and Fellows shall be at the time of their election citizens of the United States, its possessions, or Canada. Affiliate Members, Junior Members, and Associate Members shall be, at the time of their nomination for membership, citizens of the above-mentioned countries or shall have declared, in a legally accepted manner, their intention of becoming citizens.

Sec. 3. Affiliate Members shall be persons who have had six years or more of practical experience in the production of timber crops or management or protection of the forest resources of forest land, and who have demonstrated their ability in practical forest administration as evidenced by employment in positions of responsibility. Affiliate Members may be elected to Junior Membership on showing proof of eligibility.

Sec. 4. Junior Members shall be graduates of a school of forestry approved by the Council; or in lieu of such training they shall show proof that they have acquired an adequate understanding of the basic economic, business, and technical facts and principles sufficient for the foundation of a professional career in forestry and substantially equivalent to the training given in a school of forestry approved by the Council. The Council shall determine the form and method by which such proof shall be shown, including the equivalents in practical experience and in school training, which will be accepted as qualifying the candidate for election to this grade of membership.

Sec. 5. Members[1] shall be elected from the Junior Members and shall have had at least three years' experience in forestry subsequent to the date they met the requirements for Junior Membership. Advancement to Member shall indicate that in the opinion of the Council the candidate is possessed of both the requisite theoretical and practical experience and has demonstrated his acceptance of such standards of professional conduct and character as to justify the Society in accepting him as competent to represent the profession honorably and capably in the performance of his duties. Members shall be engaged in forestry work at the time of election.

Sec. 6. Fellows shall be foresters of outstanding achievement as leaders in responsible directive or distinctive individual work of a fruitful character. They shall be elected from the Members and shall be engaged in forestry work at the time of their election.

Sec. 7. Associate Members shall be persons not foresters who are scientists or technicians in fields closely allied to forestry and who are rendering substantial service to forestry, or other persons whose work and interests have furthered forestry in a substantial manner, who have shown a comprehensive understanding of the objectives of forestry, and whose association with forestry is such as to be recognized by the profession generally.

Sec. 8. Corresponding Members shall be foresters who are not citizens or residents of the United States, its possessions, or Canada, but who have shown substantial interest in American forestry.

Sec. 9. Honorary Members shall be (1) persons not foresters who have rendered distinguished service to forestry either in America or abroad, or (2) professional foresters of outstanding achievement whose field of work lies outside of, and who are not citizens of, the United States, its possessions, or Canada.

Sec. 10. Junior Members, Members, and Fellows, if in good standing, shall be entitled to vote on any question before the Society as a whole. Other classes of members may attend any meeting of the Society and take part in the discussions, but shall have no vote.

Article IV
Admission to Membership

Sec. 1. All admissions or reinstatements to the Society, and advancement from the grades of Affiliate or Junior Member to a higher grade shall be by vote of the Council.

For candidates for reinstatement and for Junior Membership who are graduates of schools of forestry approved by the Council, said Council may delegate this authority to the Executive Secretary.

For all other candidates, the Council may delegate this authority to a Council committee of three appointed by the President. The unanimous vote of this Council committee shall be required to elect a candidate; a split vote by the committee shall require consideration by the whole Council. When the whole Coun-

[1] Formerly Senior Members.

cil acts on a doubtful case or one rejected by the Council committee, eight affirmative votes shall be necessary to elect.

At least one month prior to action by the Council, the names of all candidates proposed, with a statement of their qualifications, shall be referred to the entire voting membership for comment or protest.

Sec. 2. Nominations for all grades of membership except Junior Member and Fellow shall be endorsed by a Section of the Society except for candidates not residing within the territory of any Section, when they shall be endorsed by three Members or Fellows; and shall be submitted in writing, with complete evidence of qualifications, to the Executive Secretary.

Nominations for Junior Membership for candidates who are graduates of a school of forestry approved by the Council shall be endorsed by three voting members of the Society or by a Section and shall be submitted with evidence of such graduation to the Executive Secretary.

Nominations for Junior Membership for candidates who are not graduates of a school of forestry approved by the Council shall be endorsed by a Section of the Society and shall be submitted with complete evidence of education and practical experience to the Executive Secretary.

Immediately upon a Junior Member's fulfillment of the requirements for Member, the Section in which he is domiciled may nominate him for the higher grade. A Junior Member who, at the expiration of six years, has not been nominated by a Section for the grade of Member, and who is actively engaged in forestry work, shall automatically become a Member unless his advancement is protested on the basis of lack of competence or for other reasons, and the protest is sustained by the Council.

Annually, the Executive Secretary shall notify each Section of every Junior Member in its territory who is completing his sixth year of membership, and shall request a report on him and an endorsement if he is eligible for Member. Instances of questionable eligibility shall be referred to the Council, which body shall interpret the phrase "actively engaged in forestry work" in doubtful cases. Thus those who have been Junior Members for six years, who are actively engaged in forestry work, who have had three years' experience in forestry, and whose advancement is not protested on grounds of competence or for other reasons, shall be certified as full Members by the Council.

Sec. 3. Nominations to the grade of Fellow shall be made by the written endorsement of twenty-five Members and Fellows.

Sec. 4. Election to the grade of Fellow shall be concurrent with the election of officers by letter ballot of the members of the Council and Fellows. The ballots may be counted by any system of preferential voting which the Council may prescribe provided each candidate elected thereunder shall be required to receive an affirmative vote of not less than one-half the total votes cast.

Sec. 5. Charges of unprofessional conduct against a member must be submitted to the Council in writing by five or more voting members. The Council shall consider proceedings looking toward the expulsion of any member for unprofessional conduct. It may delegate this function or any part thereof to a committee or committees on disciplinary action. The accused shall be informed of the charges against him, and be afforded an opportunity to be heard.

The affirmative vote of eight members of the Council shall be necessary to expel, reprimand, censure, or otherwise discipline a member.

Sec. 6. Conditions under which membership may be terminated or former members reinstated shall be defined in the bylaws.

Article V
Dues

Sec. 1. An admission fee of $5 shall be assessed upon original election to membership, but shall not be assessed for advancement to higher grades or for election to the grades of Corresponding Member and Honorary Member.

Sec. 2. Effective January 1, 1949 annual membership dues shall be as follows:

For Fellows, $15.

For Members, $12 for their first six years in this grade; $15 thereafter.

For Junior Members, $6 for their first three years in this grade; $9 for their second three years in this grade; $12 thereafter.

For Associate and Affiliate Members, $6.

Honorary and Corresponding Members shall not be charged dues.

Sec. 3. Annual dues shall be payable from the first day of January. Members in arrears on July 1 shall be declared in bad standing and shall forfeit from that date, until their dues are paid, the right to vote, to be elected to office, or to receive the official publications of the Society.

Entrance fees and dues of newly elected members shall be payable upon their acceptance of election to membership. Members elected after April 1, July 1, and October 1, respectively, shall be charged three fourths, one half, or one fourth of the annual dues for the year as indicated by the date of election except that members admitted to the Society after December 1 shall not be charged dues for the remainder of the calendar year.

Members promoted to a higher grade shall be charged with the dues for said grade, beginning with the quarter year in which they were elected.

The Council may remit the dues of any member for any special reason as provided in the bylaws.

No member of any grade shall be entitled to any return of fees or dues upon severance of his connection with the Society.

Sec. 4. Members and Fellows who retire from active forestry practice, after having been members of the Society for 20 years or more, may upon application to the Council continue as voting members but have their dues remitted except for an annual charge of $5 should they desire to receive the JOURNAL OF FORESTRY and other Society publications.

Article VI
Officers

Sec. 1. The officers of the Society shall be a President, a Vice President, and an Executive Secretary.

Sec. 2. The President and Vice President shall be elected from the Members and Fellows as provided in Article VIII, and shall serve for two years from January 1, or until their successors are elected. The Executive Secretary shall be appointed by the Council which is empowered to enter into contractural relations with him during the period not exceeding two years for which he is appointed.

Sec. 3. The President shall preside at meetings of the Society, shall be chairman of the Council, shall appoint such committees as may be approved by the Council, and shall perform all other duties incident to his office.

Sec. 4. In the absence of the President, or in his inability to act, his duties shall be performed by the Vice President. In the event neither can serve, the Council shall appoint a president pro tempore.

Sec. 5. The Executive Secretary shall be the executive officer of the Society under the general direction of the Council. He shall perform the duties of treasurer, be custodian of the funds and securities of the Society, and shall furnish bond in suitable amount as determined by the Council.

Article VII
Council

Sec. 1. The Society shall be governed by a Council comprised of the President, Vice President, and nine elected members.

Sec. 2. The members of the Council shall be elected from the Members and Fellows as provided in Article VIII. Members elected to the Council shall serve two years. The President, Vice President, and members of the Council may be nominated and elected for additional terms of two years.

Sec. 3. The Council shall control the funds of the Society; shall appoint the Editor in Chief of the JOURNAL; shall have the power to fill any vacancies occurring in its number; and shall perform such other duties as prescribed in the several articles and sections of the Constitution. The Council shall receive and act upon charges of professional conduct preferred against any member of the Society, as provided in Article IV, Section 5. The Council shall have power, by vote of at least eight of its members, to draft and establish bylaws but no such bylaws shall abrogate or be inconsistent with any part of this Constitution. Any action of the Council may be brought before the Society at large on written petition of

not less than 250 voting members representing at least three different Sections with at least 25 members from each. This provision shall not apply to jurisdiction over cases of disciplinary action nor to administrative matters, including the appointment or dismissal of the Executive Secretary, in which cases the decision of the Council shall be final.

Six members of the Council shall constitute a quorum.

Article VIII
Election of Council

Sec. 1. A nominating committee shall be appointed by the President, with the approval of the Council, not later than April 1 of the year in which an election is to be held. It shall be the duty of this committee (1) to provide that there shall be at least two candidates presented for the office of President and at least nine candidates presented for members of the Council; (2) to receive separate nominating petitions from the membership at large for the office of President and for each member of the Council, and to supplement such petitions with other nominations when necessary to comply with provision (1) above. All candidates for President shall be considered as nominated also for Vice President; (3) to cause to be distributed to the entire membership, at least ten weeks before the date of election, in the official organ of the Society or otherwise, its own nominations and any nominations by petition that may then be available, provided that no person shall be listed as a candidate at any time until the committee has received his written acquiescence; (4) to set the date of election, and announce it to the Society at least ten weeks in advance; and (5) to instruct the Executive Secretary to submit during the sixth week prior to the date of election, to the voting membership for letter ballot, all nominations made by the nominating committee or by petition.

Sec. 2. Nominations by petition shall be subject to the following conditions: (1) each petition shall name but one candidate; (2) all candidates must be eligible to hold elective office; (3) a petition shall bear the signatures of at least ten voting members of the Society who at the time of signing such petition are eligible to vote in the forthcoming election. A voting member may not sign more than one nominating petition for President or more than one nominating petition for member of the Council; (4) petitions must be in the hands of the nominating committee by the end of the seventh calendar week prior to the date of election.

Sec. 3. All elections shall be by the Hare system of proportional representation. Candidates for the office of President shall be voted for by all members of the Society entitled to vote. The candidate receiving the highest vote shall be declared elected President and the candidate receiving the second highest vote shall be declared elected Vice President. The quotas of votes necessary to elect each of the remaining nine members of the Council shall be determined by the usual Hare rules applicable to an election at large.

Article IX
Society Publications

The Society shall publish serially (1) a technical forestry periodical known as the JOURNAL OF FORESTRY, (2) an official organ with respect to internal matters, and such other publications as the Council may authorize. The official organ, known as SOCIETY AFFAIRS, shall be under the immediate editorial supervision of the Executive Secretary, subject to the general direction of the Council, through the President. The Council may, in its discretion, prescribe that it be printed as a supplementary section of the JOURNAL, but with independent editorial responsibility. Publication in SOCIETY AFFAIRS shall constitute reference, distribution, and notice to the membership within the meaning of these terms in Articles IV, VIII, and X of this Constitution.

The JOURNAL OF FORESTRY shall be under the immediate direction of an Editor in Chief, who shall be assisted by Associate Editors of such number and fields of duties as may be authorized or prescribed by the Council upon recommendation of the Editor in Chief. The Editor in Chief shall be primarily and directly responsible to the Council for the editorial policies, contents, and form of the JOURNAL, with final authority over its reading matter within the financial limitations set by the Council, but with full accountability to the Council for judicious and skillful performance. He shall be free from responsibility for the financial and business management of the affairs of the JOURNAL, which shall be lodged with the Executive Secretary under the general direction of the Council, but on occasion shall be consulted in these matters, and he may make to the Executive Secretary or to the Council such advisory suggestions and representations relating to the business affairs of the JOURNAL as he may deem appropriate. With his approval, the Executive Secretary may be appointed by the Council to serve as Managing Editor of the JOURNAL under the Editor in Chief, for the performance of such duties as the Council may assign him within the field of responsibility of the Editor in Chief.

The Editor in Chief shall be chosen by ballot of the Council at the beginning of each biennium for which the Council is elected, and shall serve at the pleasure of the Council or until a successor is elected. Associate Editors shall be appointed by the President upon recommendation of the Editor in Chief and shall serve until the expiration of the biennial period and the appointment of a successor; except that when a new Editor in Chief is elected in the midst of a biennial period, the term of the Associate Editors then serving shall be only until successors are appointed. The Associate Editors, the Managing Editor if appointed, and the Editor in Chief shall comprise the editorial staff of the JOURNAL.

Article X
Meetings

Sec. 1. The Society shall hold an annual meeting and such other meetings as the Council may direct. The place and date of the annual meeting shall be selected and adequate notice given to the Society at least three months in advance of the date fixed for the meeting.

Sec. 2. Resolutions adopted at the annual meeting by the vote of less than a majority of the entire voting membership of the Society shall represent the majority opinion of those voting members present and shall not be binding on the Society as a whole.

Article XI
Sections

Sec. 1. Sections of the Society may be authorized by the Council upon the written petition of thirty or more voting members, at least fifteen of whom shall be Members or Fellows, resident within a territory small enough to justify the belief that a strong local organization may be effected. Sections must hold at least one meeting each year to retain their authorization.

Sec. 2. The officers of each Section shall include a Chairman, a Secretary, and such others as may be found necessary. Section officers shall be voting members of the Society.

Sec. 3. Any Section may, subject to the approval of the Council, adopt for its own government such bylaws as it may find expedient, including the qualifications for associate members of the Section, provided that no part thereof shall conflict with the Constitution of the Society.

Sec. 4. The Council shall have the right at any time to rescind the authorization of any Section and to terminate its existence.

Article XII
Subject Divisions

Subject Divisions of the Society may be authorized by the Council upon the written petition of twenty or more voting members of the Society engaged in the special field of forestry to which the Division pertains, at least five of whom shall be Members or Fellows of the Society. Subject Divisions shall be organized only as the Council is convinced of their need, and they shall be regulated through bylaws established by the Council.

Article XIII
Amendments

The Constitution may be amended by a two-thirds vote of the members voting, provided the proposed amendments have been submitted to all voting members at least four weeks in advance of the date set by the Council for counting the ballots. Amendments shall, unless they themselves provide otherwise, be effective immediately upon their adoption.

Bylaws

Headquarters

1. The official headquarters of the Society shall be in the District of Columbia.

Citizenship

2. Transfer of citizenship outside of the United States, its possessions, or Canada subsequent to election shall not invalidate membership or the right to vote and to receive the publications of the Society, but it shall prevent transfer to a higher grade of voting membership, and such members shall also forfeit the right to hold office as a member of the Council.

Schools of Forestry Classified

3. In pursuance of Article III, Section 4, of the Constitution, the Council shall list the institutions teaching professional forestry in three classes:

a. Institutions approved by the Council. These shall be termed "Approved Schools."

b. Institutions listed by the Council as covering in their instruction the general field of professional forestry but not approved by reason of not meeting fully the standards required for such approval. These shall be termed "Listed Schools."

c. Institutions which do not provide adequately for covering in their instruction the general field of professional forestry by reason of inadequate teaching force, or incomplete curriculum or both.

Membership Requirements

Affiliate Member Grade

4. Requirements for Affiliate Grade: Practical training in forestry, or in related fields in wildland management or forest utilization, is the basic requirement.

The Affiliate grade shall include those who have acquired a practical knowledge of forestry or of related activities in the fields of wildland management or forest utilization, but who have not as yet qualified for professional grades of membership.

a. Candidates shall have at least six years of practical experience toward which may be counted as one year each semester of appropriate training at a ranger, vocational, or professional school up to a maximum of TWO semesters.

b. Candidates shall be regularly engaged in growing forests, with attendant duties such as management or protection of forest areas, supervision of silvicultural requirements in logging, erosion control, or similar forestry activities; regularly engaged in related wildland activities such as range, wildlife, or recreation management; or regularly engaged in those phases of utilization having a relation to the growing of forest crops.

Junior Member Grade

5. Requirements for Junior Grade: Theoretical training in the fundamental principles of professional forestry is the basic requirement.

Junior Membership is the temporary, probational entrance grade for professionally trained foresters.

Class A. Graduates of a school of forestry approved by the Council do not require endorsement by a Section but only by three voting members of the Society. Authoritative statement should be given as to the degree received, and the curriculum taken, which must be one that has been approved by the Council as covering the basic requirements for Junior Membership.

Classes B to G. Evidence must be presented that the candidate has acquired an adequate understanding of the basic economic, business, and technical facts and principles sufficient for the foundation of a professional career in forestry and substantially equivalent to the training given in a school of forestry approved by the Council. Pending the establishment of examinations given by the Society, this evidence shall consist of:

a. Endorsement by a Section as required by Article IV, Section 2 for candidates who are not graduates of a school of forestry approved by the Council.

b. A transcript of the scholastic record for those who have attended schools of forestry, ranger schools, or institutions giving courses in forestry. Obviously not required for those without such courses.

c. A statement covering reading or study in professional forestry subjects with supervision if any.

d. Statements of sponsors as to the acquisition by the candidate of the constitutional qualifications above stated. Evidence of practical experience is of value for this grade, only as bearing on the basic professional qualifications of the grade.

e. Practical experience in forestry work of a character tending to supplement deficiencies in required theoretical professional education, and within the field as defined for Affiliate Member, as follows:

Class:

B. Graduates of listed schools not yet approved. One year since graduation.

C. Graduates of schools of forestry, not listed. Three years since graduation.

D. Nongraduates of approved schools who have completed at least one semester of junior year. One year subsequent to said attendance for each semester uncompleted, not to exceed a maximum of three semesters.

E. Nongraduates of listed schools not yet approved who have completed at least one semester of junior year. One year subsequent to said attendance for each semester uncompleted, not to exceed a maximum of three semesters; plus one additional year.

F. Men who have had professional or vocational courses in forestry at institutions not listed or at ranger schools. Six years subsequent to attendance plus one additional year in case the candidate's instruction in technical or vocational forestry subjects has not covered at least two semesters.

G. No instruction in professional forestry. Eight years.

The experience required for these classes is therefore as follows:

Class	Years
B	1
C	3
D	1-3
E	2-4
F	6-7
G	8

f. The passing of a comprehensive civil service examination for technical positions in forestry, as given by the U. S. Civil Service Commission, shall be considered as satisfying requirements *b* and *c* above, provided the character of such examination meets the approval of the Council.

g. If and when it is demonstrated that the above requirements fail to yield satisfactory evidence that the candidate possesses the theoretical training in professional forestry which is the basis of this grade of membership, the Society may require the candidate to pass an examination approved and conducted under the direction of the Council.

h. Junior Members at time of election need not be engaged in forestry work, since the qualifications for the grade do not require it. Application for this grade of membership shall constitute sufficient proof of interest in forestry.

i. Graduates in forestry of the year 1936 or previous years from the following institutions: California, Colorado Agricultural College, Connecticut State College, Cornell, Georgia, Harvard, Idaho, Indiana (Purdue), Iowa, Louisiana, Maine, Michigan State College, University of Michigan, Minnesota, Montana, New York State College (Syracuse), North Carolina, New Hampshire, Ohio State University, Oregon, Pennsylvania State College, Utah, Washington State College, University of Washington, Yale; and of discontinued schools as follows: Biltmore, Pennsylvania State Forest Academy at Mont Alto, Colorado College at Colorado Springs, Nebraska, Harvard undergraduate—shall be eligible for membership in the Junior grade on showing proof of graduation in forestry, on the endorsement of three voting members of the Society in the same manner as for graduates of schools of forestry approved by the Council. The provision of Bylaw 5

shall apply to all candidates who graduate in 1937 or subsequent years, and to all nongraduates of schools of forestry of any year.

j. Candidates who began their forestry work and training in the year 1920 or previous years, and who shall be endorsed by a Section of the Society for Junior grade, and shall submit letters from three or more sponsors as to their grasp of forestry subjects, shall be deemed as having complied with the requirements for the grade. For candidates who began their forestry work and training subsequent to 1920, the provisions of Bylaw 5 shall apply.

Member Grade

6. Requirements for Member[1] Grade: Competence as a professional forester is the basic requirement.

a. Previous election to Junior grade.

b. Three years' experience in forestry, the purpose of which is to demonstrate that the candidate, in addition to his Junior requirements, has demonstrated his competence as a practicing forester to accept responsibility and perform duties of a professional character such as to justify the Society in accepting him as competent to represent the profession capably in the performance of his duties, and his adherence to such standards of professional conduct and character as to justify the Society in accepting him as competent to represent the profession honorably in the performance of his duties and in his relations with others.

c. Engaged in forestry work at the time of election. For prospective Members, who have full Junior qualifications, forestry work shall include all activities having to do with the management of forest land and the utilization of any of its resources. Forest land is any land on which trees are the principal crop or cover, or on which it is proposed to produce trees as the principal crop or cover, or land which forms an integral part of such forest land in management of said land, or land on which erosion control is practiced or planned, with aid of forest trees, or grazing land which forms part of an administrative unit whose principal function is forestry, or land on which game management is practiced in connection with forestry, or any similar lands on which the forest is an integral and dominant feature. Forestry work shall therefore include, for Members, the following activities as above qualified: arboriculture and municipal forestry; park management; recreational management; grazing; wildlife; protection including erosion control; fire, insects and diseases; streamflow regulation including chaparral areas silviculture; forest management and administration; forest utilization including logging, manufacturing, and sale of products; research in any or all of the above fields; teaching in any or all of the above fields; office, supervisory, or administrative duties in any of the above fields; whenever the accomplishment of these aims requires the application of professional forestry knowledge.

d. Individuals who have not qualified for Junior Membership cannot obtain the Member grade. The two requirements for election to the grade of Member of persons engaged primarily with resources other than trees or forestry are Junior Membership, indicating the possession of basic theoretical training in professional forestry, and activities related to forest land as defined. It follows that persons who are not Junior Members, or Junior Members whose activities have nothing to do with forest land, such as the administration of grazing on the nonforested public domain, wildlife management concerned only with prairie or waterfowl management unrelated to forests, or erosion engineers in treeless regions, do not qualify as Members.

Except as provided for under qualifications for Junior grade, additional study shall count only as the equivalent of the same period of experience, it being the purpose of this grade to require preparation in both theoretical and practical forestry. A minimum of two years of practical experience in addition to study shall be required for Member.

Associate Member Grade

7. Requirements for Associate Membership. There shall be two alternate qualifications for Associate Membership.

a. Persons who have not the professional forestry qualifications of Junior Members, but who otherwise qualify as scientists for a grade equivalent to Senior Membership, which is the conception of this grade. Scientists working in the field of forest products but whose training has not included a large enough field of forestry to qualify as Junior Members belong in this grade. This grade includes graduates of specialized curricula in wood utilization, pulp and paper manufacturing, logging engineering, or such specialized fields as range management or wildlife, or other specialties, if said persons are equipped as scientists wtih a professional education equivalent to that of Junior Members but in their own field, and whose activities are conducted in close relation with forestry or foresters, in case such specialized curricula are not accepted by the Council as giving full professional training in forestry, belong in this grade. The same is true of economists in such subjects as forest taxation, land utilization, and the lumber industry.

b. Persons who are not possessed of a scientific education and are not pursuing scientific activities, but who through their public activities in connection with forest economics and forest policy or their individual efforts along any line of forestry, public or private, such as outstanding success in private forest management, have shown that they understand the fundamental objectives and principles of forest economics, management, and technical practice, and whose services in these respects are recognized generally by members of the profession who would normally be expected to know of their activities, are eligible for this grade. The words "recognized by the profession generally" will be taken to mean that if the members of a Section generally recognize that these services have a value to the profession generally, that is, extending outside the boundaries of the Section, the individual is eligible, if approved by the Council. Persons of lesser merit should be associated not with the Society but only as associate members of a Section, when its bylaws provide for such a grade.

Fellow Grade

8. Requirements for Fellow: The prescribed eligibility requirements for Fellow indicate that a candidate's record and reputation should be well known among Members and Fellows, who alone are entitled to vote for these candidates. Such candidates should be selected from among the most widely known Members, whose professional service has been exceptionally outstanding.

9. A petition nominating a Member for advancement to Fellow must be accompanied by a biographical sketch of the candidate, including a brief account of his professional career and accomplishments. A sketch of biographical facts not exceeding 200 words shall be printed for each nominee for the grade of Fellow.

Membership Nomination and Election Procedure

10. Endorsement by a Section, as provided in Article IV, Sec. 2, may be accomplished either by vote of the Section or, when the Section bylaws so provide, by a committee of the Section empowered to act.

11. Publication of the names of candidates for membership as required by Article IV, Sec. 1, shall take place in SOCIETY AFFAIRS. For the purpose of such publication, "qualifications" is interpreted to mean a statement of the candidate's forestry education, with degrees and dates, his present position, and the date of his election if he is already a member in another grade. Upon request, any member entitled to vote shall be provided with more detailed information regarding the qualifications of any particular candidate.

12. The Council may elect a candidate to a lower grade of membership than that for which he was nominated, but not to a higher grade, without further publication.

13. A nomination rejected on the second ballot may not be resubmitted for the same grade of membership until after twelve months following such rejection. If the endorsers so desire, it may be resubmitted at any time for a lower grade.

14. The Executive Secretary shall promptly notify each successful candidate of his election and membership shall date from date of election, unless the Executive Secretary, as empowered by the Council, shall extend the period of acceptance as provided by Bylaw 37. If not accepted within 90 days after noti-

[1]Formerly Senior Member grade.

fication by the Executive Secretary, or within 90 days after the periods as extended by the Executive Secretary, election shall be void.

15. The names of newly elected members shall be made known to the membership, through publication in the first issue of SOCIETY AFFAIRS succeeding the election in which they can appear.

16. The Executive Secretary shall supply each newly elected member with a copy of the Constitution and Bylaws of the Society.

17. All nominations, except of candidates for Fellow, Honorary Member, and Corresponding Member, will be prepared on the printed forms provided by the Executive Secretary and approved by the Council. These forms will carry instructions as to how to supply the factual evidence required of a candidate's eligibility, in such matters as name, date and place of birth, education, professional experience, and other data.

18. Every nomination, except of a candidate for Junior Membership who is a graduate of a school of forestry approved by the Council, must be supported by three or more letters of endorsement from voting members explaining how and why the candidate is eligible for the grade of membership for which he is nominated. In such letters of endorsement it is not sufficient for the sponsor simply to approve the candidate's election; he must in addition, on the basis of his personal knowledge of the man and his work, explain briefly and clearly how and why he believes him to be eligible under the requirements of the Constitution.

19. All nominations for membership in the Society will be sent by the Section or by the group of individual members who are sponsoring the candidate to the Executive Secretary at the Society's headquarters office in Washington, D. C. He shall check each nomination to see that the Constitution and Bylaws have been complied with as to endorsement and presentation of the factual evidence of eligibility. He shall acknowledge receipt of each nomination to the candidate, and shall inform him as to the procedure and approximate period required for election, the provisions of the bylaws as to dues, and any other facts deemed desirable.

The candidate's name will then be listed for publication, under the heading "Announcement of Candidates," in the next available issue of SOCIETY AFFAIRS. Such publication shall serve as acknowledgment to the Sections or groups of individuals sponsoring the nominations. Copies of the nomination papers in each case will, on the appearance of such lists, be sent by the Executive Secretary to the Council for ballot with the exception, that in the case of candidates for Junior membership who are graduates of a school of forestry approved by the Council, the Council may delegate its authority to the Executive Secretary to declare such candidates elected after the publication of their names, unless for some reason they are unqualified or their candidacy should be referred to the entire Council. With the nomination papers will be included any comments on the candidate and his eligibility. Elections shall not take effect until after the expiration of the period of 30 days following the publication of said list. If within this period one or more protests against the election of any candidate are received, the Executive Secretary shall conduct such investigations as are necessary to obtain full and adequate information on which to make just and final decision as to the eligibility of the candidate.

In case of a favorable vote, and in the absence of any protests, the candidate and his sponsors will be immediately notified of his election to membership by the Executive Secretary.

When a candidate fails of election the results will be reported back to the Section or group of members sponsoring the nomination. The reasons for this action will be included in order that the sponsors may be guided accordingly, if they desire to submit the case for a second ballot.

Official Membership Emblem

20. The official emblem for Fellows and Members is a gold shield-shaped pin with "Society of American Foresters 1900" in gold letters on a green enamel background surrounded by a gold border. Only Fellows and Members shall wear this badge.

The emblem for Junior Members is the same design except that it has a white enamel border instead of a gold border.

The emblem for Associate, Corresponding, and Honorary Members shall be the same as the Senior emblem except that the enamel background shall be brown instead of green.

Termination of Membership

21. Membership may be terminated by (1) voluntary resignation; (2) failure to pay dues; (3) expulsion for unprofessional conduct as provided in Article IV, Sec. 5.

A voluntary resignation shall be accepted by the Executive Secretary provided charges of unprofessional conduct are not pending against the member and provided the member is in good standing at the time and his dues are paid for the current year, except that the current year's dues shall not be required from members resigning prior to January 31, in any year.

In the case of a member whose dues remain unpaid on November 1, the Executive Secretary shall notify both the member himself and the Secretary of his Section, that the dues must be paid or a request for remission or postponement made within thirty days. For newly elected members the provisions of Bylaw 39 shall apply. If the dues are not paid, nor a request for remission or postponement made by the member or his Section within thirty days after such notice from the Executive Secretary, membership shall automatically terminate, unless charges of unprofessional conduct are pending, in which case membership shall not terminate until the charges have been disposed of. A member thus dropped for nonpayment of dues shall not be eligible for reelection to any grade of membership until he shall have paid the dues in arrears at the time he was dropped.

In case either the member or his Section requests remission or postponement of dues, the Council shall act upon such request promptly. The Council may remit or postpone the payment of dues of any member upon its own initiative.

22. Notice of all terminations of membership shall be given to the membership at large, through publication in SOCIETY AFFAIRS or otherwise, and the Sections concerned shall be notified.

Unprofessional Conduct

23. It will be regarded by the Society unprofessional conduct for a member, when he has reason to know that an appointment to a position not yet vacant will be made possible by the dismissal for political reasons of the present incumbent:

a. To seek such appointment through political channels;

b. To accept such appointment.

24. The seeking or accepting of political endorsement for appointment to a vacant position does not necessarily constitute unprofessional conduct, but should be avoided as far as possible because it tends to identify the applicant with a political instead of a merit system of employment and to render him subject to dismissal when party government changes.

25. It shall not be required that all five members signing charges of unprofessional conduct, as provided in Article IV, Sec. 5, be prepared to submit evidence in support of such charges. The purpose of the provision is to prevent hasty action by requiring that the matter must be sufficiently serious, in the judgment of five members, to warrant further investigation by the Council.

26. Members preferring charges of unprofessional conduct will be expected to cooperate with the Council by submitting such evidence as they may have, or by directing the Council to other sources of information.

27. The names of persons signing charges in accordance with Article IV, Sec. 5, shall not be made known to the accused, nor shall he be informed that charges have been made unless and until the Council, after due investigation, shall have become convinced that such charges appear to be sufficiently well founded to be brought to his attention.

28. If, after investigation, any or all of the charges made under the provisions of Article IV, Sec. 5, appear to a majority of the Council to be well founded, a statement of such charges shall be submitted to the accused, who shall then have a period of sixty days within which to prepare and submit a written defense. After the expiration of such sixty days the case shall be submitted for the decision of the Council, by letter ballot.

The membership of a member charged with unprofessional conduct in accordance with Article IV, Sec. 5 shall not be terminated either by voluntary resignation or by failure to pay dues until the Council has disposed of the charges. Pending such disposition, a member charged with unprofessional conduct who ceases to pay dues shall not receive Society publications and shall not have the privilege of voting.

29. The Council may, under the authority of Article IV, Sec. 5, appoint a temporary committee to investigate charges submitted to it in proper form against a member, when, under Bylaw 30 the Council has voted to proceed with such investigation. Such committee shall be composed of from five to seven members other than the Council, a majority of whom shall be from the Section in which the defendant resides. The President shal designate the chairman. Within the period of sixty days allowed the defendant, under Bylaw 30, said defendant shall submit to the chairman of this committee the evidence for his defense.

The committee shall itself investigate all evidence for or against the defendant, and shall inform him of the general nature of the evidence in its possession in support of the charges. On the conclusion of this investigation the committee shall afford the defendant, if he so requests, an opportunity to present witnesses or further evidence in his own behalf.

On the conclusion of the hearing the committee shall transmit its report and evidence to the Council, together with its recommendations for action. Final decision shall rest with the Council under Article IV, Sec. 5.

30. a. When the Council declines to investigate the charges, the accused is not informed of their existence and any public reference to them is, therefore, wholly inappropriate. In occasional instances when the accused learns of the existence of such charges and wishes to have his name publicly cleared, the President shall, if specifically requested by the accused, publish a brief statement in SOCIETY AFFAIRS to the effect that charges of unprofessional conduct have been preferred against Mr. Blank, but that the Council has not regarded them as sufficiently well-founded to deserve investigation.

b. When the charges are investigated by the Council and dismissed, the accused and the accusers shall be so informed, but there shall be no publicity unless specifically requested by the accused. In that case, the President shall publish a brief statement in SOCIETY AFFAIRS to the effect that charges of unprofessional conduct have been preferred against Mr. Blank, and after investigation by the Council have been dismissed as without justification.

c. When the charges are investigated by the Council and sustained, the President shall publish in SOCIETY AFFAIRS a brief statement that Mr. Blank has been found guilty of unprofessional conduct and has been disciplined as indicated.

d. When further information is requested by a Section of the Society, by an individual member, or by a nonmember with a legitimate interest in the matter, the inquirer shall be supplied by the President with a statement of the specific respects in which the Council has found the accused guilty of unprofessional conduct. The original charges may or may not be included as circumstances warrant. Supplemental statements of this sort may be published in SOCIETY AFFAIRS if there appears to be a widespread demand for the information contained therein, but only with the approval of the Council.

e. When there is a general and legitimate demand for still further information, the President shall prepare a statement giving in full the reasons for the Council's decision, and including as complete an analysis of the charges and of the evidence relating thereto as may in his judgment be wise. This statement shall be submitted for the approval of the Council, which shall also decide whether or not it shall be published and if so in what form. The publication of any statement dealing with cases of disciplinary action in Society publications should be accompanied by a statement to the effect that it is published solely for the information of the members.

31. Action by the Council under the provisions of Art. IV, Sec. 5, shall be final.

Reinstatement

32. Except as provided below, a former member dropped for nonpayment of dues shall not be eligible for reelection to any grade of membership until he shall have paid the dues in arrears at the time he was dropped. Endorsement of his nomination is not required nor is the payment of entrance fee. Publication of his name is required.

Former members who have served honorably in the armed forces and who were dropped for nonpayment of dues during such period of service may be reinstated without payment of arrears.

33. Members expelled or forced to resign because of unprofessional conduct may be reinstated only by unanimous vote of the Council.

34. Former members of a grade higher than Affiliate Member shall be eligible to reelection to the grade which they previously held, provided, in case of Member or Fellows, that they are engaged in forestry work at the time of reelection.

Dues

35. Members of all grades except Corresponding and Honorary Members shall be billed for dues by the Executive Secretary as soon as practicable after January 1 of each year. Those whose dues remain unpaid shall be billed again on or about April 1, and those whose dues are still unpaid shall be notified as soon as possible after July 1 that they are in bad standing and ineligible to vote, receive the Society's publications, or be a candidate for office until their dues are paid.

36. Members promoted to a higher grade shall pay the amount of excess dues over the former rate, dating from the first of the month succeeding the date of promotion.

37. Under Article V, Sec. 3, the dues of new members shall be paid for the quarter during which they were elected, except that the Council may enpower the Executive Secretary on request of the member to remit the dues covering a period up to six months from date of election, provided that for financial or other reasons he has been unable to accept election at time of notification. If at the expiration of said period the member renews his request for extension and the circumstances warrant such action, the Executive Secretary may remit the dues for a second period, not exceeding six months, or a total period not exceeding one year from date of election. New members shall receive the JOURNAL OF FORESTRY for the full quarter in which election is accepted and for which dues are paid. A new member who is already a subscriber to the JOURNAL shall be credited with the unexpired portion of his subscription at one-twelfth of the annual subscription rate, for each issue.

38. As provided in Article V, the Council may remit or postpone the payment of dues of any member on account of sickness, absence from the United States or its possessions or Canada, unemployment or financial stringency, temporary or permanent, or for other reasons which the Council may deem sufficient. In especially meritorious and exceptional cases when the member has rendered long and faithful service to the Society and when his financial status makes such action appropriate, the Council may remit dues permanently, providing at least eight members of the Council favor such action. Retirement for age from active forestry practice on a pension or a retirement annuity will not alone be deemed sufficient reason to grant a member permanent remission of dues or life membership.

39. The Executive Secretary is authorized, if and when the Section concerned so recommends, to place a member on the inactive list. The Section's recommendation must be based on satisfactory evidence that the member's financial circumstances warrant such consideration. Temporary service of a member in his nation's armed forces will warrant granting him, at his request, inactive status for the duration of such service. During such inactive period a member will not be required to pay Society or Section dues; he will not be allowed to vote or otherwise take formal part in Society affairs; nor will he receive the Society's publications. An inactive member may restore himself to active membership by notifying the Executive Secretary (preferably through his Section secretary),

that he is ready to resume payment of his dues. He will not be required to pay up back dues for the period during which he was inactive.

Council: Nomination and Election

40. The date of election, to be selected by the nominating committee under provisions of Article VIII, Sec. 1, shall be not before December 1, or later than December 15.

41. The nominating committee appointed under the provisions of Article VIII, Sec. 1, shall be appointed by April first preceding the date of election and shall consist of three or more Members or Fellows. The names of the committee and the date of election shall be published in the May issue of SOCIETY AFFAIRS together with a notice calling the attention of the membership to the Constitutional provisions regarding nominations by petition, and listing the names of officers and Council members whose terms of office expire at the end of the current year.

A brief and strictly factual professional biography of each candidate for president shall be published in that issue of SOCIETY AFFAIRS preceding an election.

42. The ballots sent to the members shall (1) state the number of offices to be filled; (2) list the names of the candidates in alphabetical order; (3) give the address and Section membership of each candidate; (4) show the closing date for receiving the ballots; (5) quote the provisions of Article V, Sec. 3, regarding arrears in dues; (6) be accompanied by a return envelope addressed to the Executive Secretary and a smaller blank envelope for the return of the ballot. On the outer addressed return envelope shall be the directions, "After closing the envelope endorse your full signature on the back." All necessary checks to determine whether a member is in full standing shall be made without opening either envelope. The outer envelopes shall first be opened and laid aside, and when all valid ballots have been thus freed from identification, they shall then be opened and counted.

43. Ballots shall be sent to all Junior Members, Members, and Fellows, regardless of whether they are in bad standing. Ballots will be counted if the voters' dues are paid by the date of the election.

44. The ballots shall be counted by tellers appointed by the President. The results of the election shall be announced promptly to the winning candidates, to each of the several Sections, and to the Society at large by publication in the January issue of SOCIETY AFFAIRS. The results shall also be announced at the annual meeting if it falls on a fitting date.

45. Regular elections shall be held in the odd-numbered years. Vacancies occurring between regular elections shall be filled by the Council, as provided in Article VII, Sec. 3. Such appointments by the Council shall be only for the period until the next regular election.

46. The President pro tempore appointed under the provisions of Article VI, Sec. 4, shall serve until the next regular election, or until the President or Vice President is able to resume his duties. Such President pro tempore may be appointed either from the membership of the Council or from outside. If he is appointed from the Council membership, another member may be appointed to the Council to fill the vacancy.

47. Ballots under the Hare system of proportional representation, prescribed by Article VIII, Sec. 3, shall be counted by the method described in Leaflet No. 9 issued by the Proportional Representation League in March, 1921, or in Leaflet No. 9, revised edition, issued in October, 1925. "Majority quota" prescribed for the selection of President is understood to mean a majority of all the valid votes cast, arrived at through a series of transfers similar to those by which the minimum quotas are reached.

Officers: Duties, Etc.

48. The President, Executive Secretary, Editor-in-Chief shall report to the Society at the annual meeting regarding their activities during the preceding year, and their reports shall be published in SOCIETY AFFAIRS as soon as may be practicable thereafter.

49. The Treasurer's report shall cover the fiscal year ending November 30, instead of the calendar year.

50. Chairmen of standing and other committees shall report to the annual meeting at the option of the President, and their reports may be published as the President may direct.

51. None of the elected officers of the Society shall receive compensation from the Society. An officer or delegate of the Society may be reimbursed for his actual expenses for travel and subsistence and other necessary expenses in attending meetings or transacting Society business, if specifically authorized by the Council.

Council: Duties, Authority, Meetings

52. The Council shall as need arises formulate and publish statements expressing the position or attitude of the Society on matters coming under the provision of Article II of the Constitution. On any subjects on which the membership has voted through a referendum, such statements shall be in conformance with the position thus taken by the Society. The Council may on its own initiative refer any such statements to the membership for ballot, and shall do so in case of valid appeal from its action, when taken by members in conformity with Article VII, Sec. 3, unless within two months from the date of receipt of said appeal the Council decides to adopt the position of the petitioners.

Referendum ballots when required by the above procedure shall be mailed only after the members have received at least one issue of the JOURNAL and SOCIETY AFFAIRS subsequent to the original publication of the proposals. Discussions of such proposals should preferably appear in these publications, but if deemed necessary by the Council or by the proponents brief summaries may also accompany the ballot. The final date for receiving ballots shall be five weeks from the date of mailing the same, and this final date shall be indicated on the ballot.

The right of appeal by petition, as provided and limited in Article VII, Sec. 3, shall lie against any action or position taken by the Council; provided that in the case of conflicting petitions or petitions opposing a referendum previously initiated by the Council but not yet completed, the Council shall determine the course deemed best for the orderly and effective management of Society affairs.

53. Meetings of the Council shall be held upon call by the President, or the President *pro tem*, or upon request by a quorum of the Council. Regular meetings may be held at such times and places as may be fixed by the Council. Except in case of emergency all members of the Council shall be notified at least 15 days in advance of the date and place of the meeting and, as far as practicable, of the principal matters to be acted upon.

54. In the absence of a quorum (six members) at any meeting of the Council, action may be taken subject to approval of a majority of the Council by subsequent ballot. A member unable to be present at any meeting may authorize another member (in writing) to cast his vote on any matter that has been presented for his consideration in advance of the meeting.

55. Absent members shall be notified promptly of action taken at meetings of the Council, even though a quorum may have been present, so that further ratification is not necessary.

56. Where prompt action is necessary, and in matters of routine or minor importance a majority of the members present at a duly called meeting of the Council can take action provided a quorum is present. The general policy, however, on important matters on which there appears to be serious division of opinion, will be to get the votes of absent members by mail before taking decisive action.

Between meetings of the Council, matters may be referred to it for decision by any officer, Council member, Section, or by petition of five or more members. Matters not previously discussed at a Council meeting will be opened to exchange of opinions for at least four weeks before a ballot is taken, provided that in matters of great urgency the President is empowered to call for an immediate vote of the Council. Such expressions of opinion as are received from Council members will accompany the ballot when it is presented to the Council for its final vote.

57. An executive committee of the Council, consisting of the President and such other members as the Council may select, may be designated for handling routine and emergency business of the Society.

Committees

58. Other committees than those provided for in the Constitution and Bylaws may be appointed by the President when the creation of said committees has received the approval of the Council. These may be either temporary committees, for some definite task, or standing committees, to serve until discharged or their successors are appointed. They shall consist of as many members and of such grades of membership as the President or the Council may determine. The members of all standing committees shall serve for the same term as that of the President by whom they were appointed, and until their successors are appointed. Members of all committees shall be appointed by the President, who shall, when possible, consult the chairman of said committee as to the other appointments. Temporary committees appointed for a definite administrative purpose are automatically discharged on the completion of their services. Temporary committees having charge of investigations may be discharged by the Council, at the request of the committee through its chairman, or on the initiative of the Council. Any member of any committee including the chairman, is subject to removal by the President with the consent of the Council, in the interest of efficiency, at any time during his term of office. The President may proceed to fill the vacancies thus created. No officer of the Society or member of the Council may serve on the Committee on Nominations for the biennial election, except that the Executive Secretary may serve as secretary of this committee without a vote.

59. No committee shall expend funds of the Society except as duly authorized by the Council. Committees shall be supplied with necessary stationery and other supplies through the Executive Secretary.

Finances

60. The fiscal year of the Society shall end on November 30.

61. The Executive Secretary's books shall be audited semiannually by a certified public accountant, at the close of each fiscal year and at midyear.

62. The Executive Secretary and all employees handling funds of the Society shall be bonded in suitable amounts as decided by the Council, at the Society's expense.

63. All bills against the Society shall be approved by the person or committee authorized to incur expenses before they are paid by the Executive Secretary.

64. A Finance Committee shall be appointed by the President, with the approval of the Council, to advise with the Executive Secretary and with the Council regarding the budget and the handling of the Society's investments. The Finance Committee may also be called upon in an advisory capacity with reference to the renting of office space and in the employment of such clerical and other assistance as may be necessary to carry on the business of the Society, subject to the limitations of the budget.

65. The funds of the Society except those needed for current use shall be deposited in a savings bank aproved by the Finance Committee or invested in federal securities. No other class of securities shall be authorized as investments for Society funds. This bylaw shall not be retroactive as ordering the sale of existing securities and reinvestment, except in the discretion of the Finance Committee.

66. A budget showing estimated receipts and expenditures shall be prepared by the Executive Secretary at the beginning of each year, in consultation with the Finance Committee. Upon approval of the budget by the Council, expenditures within the limitations of the budget may be made by the Executive Secretary without further authorization from the Council. Expenditures for any purpose in excess of the amount allotted in the budget, or for purposes not provided for in the budget, shall require special authorization of the Council, except that minor transfers from one appropriation to another may be made without such authorization. The budget may be amended at any time by action of the Council.

67. The Permanent Fund of the Society shall be held intact and only the income from it shall be spent for such special purposes as the Council may direct. In the absence of such direction, the income shall accrue in a special reserve fund, subject to such dispositions as the Council may make. The Permanent Fund may be increased from time to time through contributions for that specific purpose, or through action by the Council.

68. Special funds donated or set up for special objects shall be accounted for separately from the general funds of the Society.

Meetings

69. A committee on Meetings shall be appointed by the President to consist of such number and such grades of members as he may think best. The chairman of this committee shall be a Member or Fellow and shall be appointed by June first of the current year. Such appointment shall be announced promptly in SOCIETY AFFAIRS.

70. The committee shall be responsible for the technical program of the meeting, but not for the program of the business meeting. It shall appoint or select speakers and topics and shall prepare a preliminary program and submit it to the Executive Secretary in time for him to have it printed and mailed to the membership. The Executive Secretary shall have the program printed and mailed to the members at least five weeks before the date of the annual meeting.

71. A member desiring to present a paper at the annual meeting shall notify the committee on the meeting, either directly or through the Executive Secretary, at least seven weeks before the date of the meeting, of the title of his paper, and shall at the same time submit at least a summary of the paper. It shall be optional with the committee whether such paper shall be read and discussed at the meeting, or read by title only.

Society Publications

72. The Society's official publication, within the meaning of the Constitution, shall consist of two serial publications of 12 issues each to appear monthly, namely, the JOURNAL OF FORESTRY and SOCIETY AFFAIRS. SOCIETY AFFAIRS is designated as the official organ or publication of the Society referred to in the various sections of the Constitution, and publication in it shall constitute notice to the membership as required in Articles IV, VIII, and X and in the ByLaws. The contents of SOCIETY AFFAIRS are not subject to the editorial staff and do not come under the provisions of Article IX of the Constitution. The Editor in Chief shall have sole responsibility for the final selection and approval of the contents of the JOURNAL OF FORESTRY, and its form and workmanship. He shall consult the editorial staff before making any important changes in format or cover. In the exercise of these responsibilities he shall be subject to budget limitations and general policies as determined by the Council.

73. Students of approved schools of forestry may be granted the privilege of subscribing to the JOURNAL at a reduced rate so long as they are bona fide students. This privilege shall not apply to members of the Society who are taking graduate work.

74. A member in arrears for dues on July 1 shall receive no more issues of the JOURNAL until his dues are paid. Upon paying his dues he shall be entitled to receive those issues of the JOURNAL that he has missed, if he so requests.

Sections

75. Every member of the Society in good standing, of whatever grade, is automatically entitled to membership in that Section of the Society in which he shall establish his domicile. The domicile of a member shall be his home or residence, unless his place of business and his professional affiliations lie within the territory of another Section, when, by declaration he may establish his domicile with said other Section for the purpose of Section membership. An individual can be a voting member of only one Section, but may become an associate member of any other Section.

76. Each Section shall confine its regular membership to individuals whose domicile, as above defined, is within its territory, but may admit associate members to the Section who reside elsewhere.

77. Nonmembers of the Society may become associate members of a Section but may not become regular members or serve as officers of a Section. This applies to former members of the Society whose membership has been terminated, as well as to those who never have been members.

78. The Executive Secretary shall furnish to each Section secretary near

the beginning of each year the names and addresses of all members of the Society in good standing within the territory of the Section. He shall also notify the Section secretaries from time to time during the year of changes due to death, resignation, termination of membership, new elections, or transfer from one jurisdiction to another.

79. The Section shall report promptly to the Executive Secretary of the Society the results of elections of Section officers; the adoption of Section bylaws and amendments thereto; and shall report at least once a year on the proceedings of the Section.

80. The Section secretary shall furnish the Editor in Chief with copies of such papers delivered before meetings of the Section as seem appropriate for publication in the JOURNAL, unless the author desires to make other disposition thereof.

Section Chapters

81. A Chapter of any Section may be authorized by the officers or executive committee of the Section upon written petition of fifteen (15) or more voting members of the Section resident in an area where a strong local organization may be effected. The boundaries of a Chapter shall be established by the Section on recommendations from the members concerned.

Chapters shall hold at least one meeting each year to retain their authorization. Open meetings are specifically authorized.

The officers of each Chapter shall include a chairman, a vice chairman, and a secretary-treasurer, who shall be voting members of the Society, serving concurrently with the officers of the Section, and elected by the members of the Chapter. A current list of the officers and the members of each Chapter shall be on file with the secretary of the Section.

A section is authorized to appropriate funds to the Chapter for the conduct of its business.

Actions or recommendations of a Chapter on Society matters will be transmitted to the Council with the recommendation of the Section. The Section shall have the right to rescind the authorization of any Chapter and to terminate its existence.

Subject Divisions

82. The purpose of Subject Divisions of the Society shall be to provide an effective means of considering various phases of forestry, supplementary to that provided through Society or Section committees, and not to create vocational groups within the Society.

83. Membership in Subject Divisions shall be open to all members of the Society, the basis of membership being interest in the subject and desire to participate in the work and discussions of the Subject Division.

84. Subject Divisions shall be governed by the same regulations, prescribed in the Constitution and Bylaws, as are committees of the Society with respect to Society policies. They shall not issue to the public any statements or reports, except (1) through the Sections of the Society, if approved by said Sections, and in conformance with adopted policies of the Society, or (2) through the Council or ballot of the members if involving controversial questions requiring Society approval.

85. The same freedom of discussion is permitted to Subject Divisions as to Sections and the Society at large, and the same principles of publicity through the JOURNAL apply to Subject Divisions as to individuals, Sections, and the Society.

Bylaws and Amendments

86. All Bylaws shall become effective upon adoption unless otherwise specified by the Council.

87. All Bylaws shall be published in SOCIETY AFFAIRS or otherwise made available to the members, as soon as practicable after adoption.

88. The Executive Secretary shall notify all members, through publication in SOCIETY AFFAIRS or otherwise, of the adoption of any amendments in the Constitution or Bylaws.

Foresters' Code of Ethics

The purpose of these canons is to formulate guiding principles of professional conduct for foresters in their relations with each other, with their employers, and with the public. The observance of these canons secures decent and honorable professional and human relationships, establishes enduring mutual confidence and respect, and enables the profession to give it maximum service.

Professional Life

1. The professional forester will utilize his knowledge and skill for the benefit of society. He will cooperate in extending the effectiveness of the forestry profession by interchanging information and experience with other foresters, and by contributing to the work of forestry societies, associations, schools, and publications.

2. He will advertise only in a dignified manner, setting forth in truthful and factual statements the services he is prepared to render for his prospective clients and for the public.

Relations with the Public

3. He will strive for correct and increasing knowledge of forestry and the dissemination of this knowledge, and will discourage and condemn the spreading of untrue, unfair, and exaggerated statements concerning forestry.

4. He will not issue statements, criticism, or arguments on matters connected with public forestry policies, without indicating, at the same time, on whose behalf he is acting.

5. When serving as an expert witness on forestry matters, in a public or private fact finding proceeding, he will base his testimony on adequate knowledge of the subject matter, and render his opinion on his own honest convictions.

6. He will refrain from expressing publicly an opinion on a technical subject unless he is informed as to the facts relating thereto, and will not distort or withhold data of a substantial or other nature for the purpose of substantiating a point of view.

Relations with Clients, Principals, and Employers

7. He will be loyal to his client or to the organization in which he is employed and will faithfully perform his work and assignments.

8. He will present clearly the consequences to be expected from deviations proposed if his professional forestry judgement is overruled by nontechnical authority in cases where he is responsible for the technical adequacy of forestry or related work.

9. He will not voluntarily disclose information concerning the business affairs of his employers, principals or clients, which they desire to keep confidential, unless express permission is first obtained.

10. He will not, without the full knowledge and consent of his client or employer, have an interest in any business which may influence his judgement in regard to the work for which he is engaged.

11. He will not, for the same service, accept compensation of any kind, other than from his client, principal, or employer, without full disclosure, knowledge, and consent of all parties concerned.

12. He will engage, or advise his client or employer to engage, other experts and specialists in forestry and related fields whenever the client's or employer's interests would be best served by such actions, and will cooperate freely with them in their work.

Relations with Professional Foresters

13. He will at all times strive to protect the forestry profession collectively and individually from misrepresentation and misunderstanding.

14. He will aid in safeguarding the profession against the admission to its ranks, of persons unqualified because of lack of good moral character or of adequate training.

15. In writing or in speech he will be scrupulous to give full credit to others, in so far as his knowledge goes, for procedures and methods devised or discovered and ideas advanced or aid given.

16. He will not intentionally and without just cause, directly or indirectly, injure the reputation or business of another forester.

17. If he has substantial and convincing evidence of unprofessional conduct of a forester, he will present the information to the proper authority for action.

18. He will not compete with another forester on the basis of charges for work by underbidding through reduction of his quoted fee after being informed of the fee quoted by a competitor.

19. He will not use the advantages of a salaried position to compete unfairly with another forester.

20. He will not attempt to supplant another forester in a particular employment, after becoming aware that the latter has been definitely engaged.

21. He will not review the work of another forester, for the latter's employer, without the other's knowledge, unless the latter's connection with the work has been terminated.

22. He will base all letters of reference or oral recommendation on a fair and unbiased evaluation of the party concerned.

23. To the best of his ability he will support, work for, and adhere to the principles of the merit system of employment.

24. He will not participate in soliciting or collecting financial contributions from subordinates or employees for political purposes.

25. He will uphold the principle of appropriate and adequate compensation for those engaged in forestry work, including those in subordinate positions, as being in the public interest and maintaining the standards of the profession.